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A Monthly Journal of Engineering Progress

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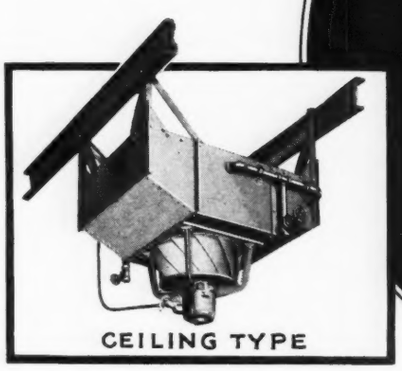

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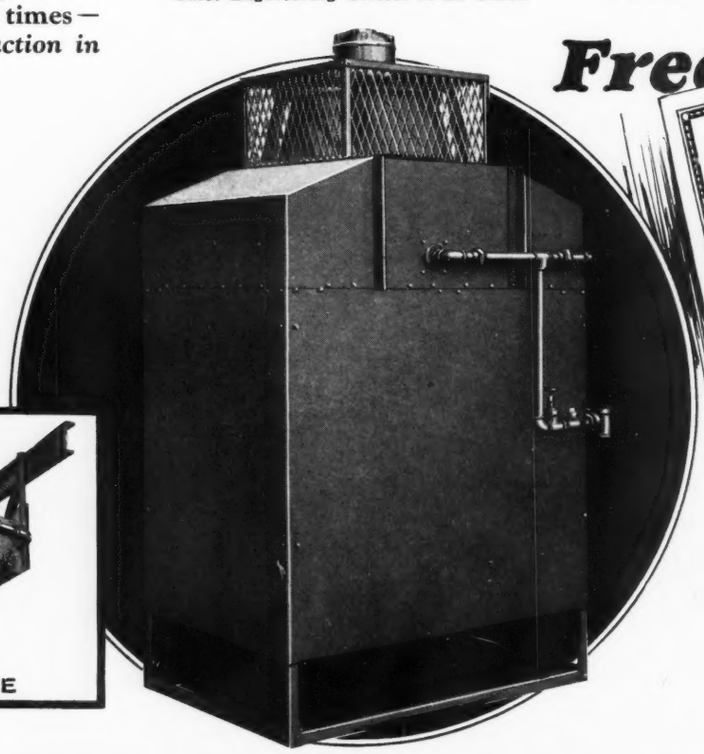

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The Heating and Ventilating Magazine

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MAY, 1927

THE NEW MINNEAPOLIS AUDITORIUM

Showing Pent House Containing General Air Exhaust Chamber, with Louvered Openings on Four Sides

The Cooling and Ventilation of the Minneapolis Auditorium

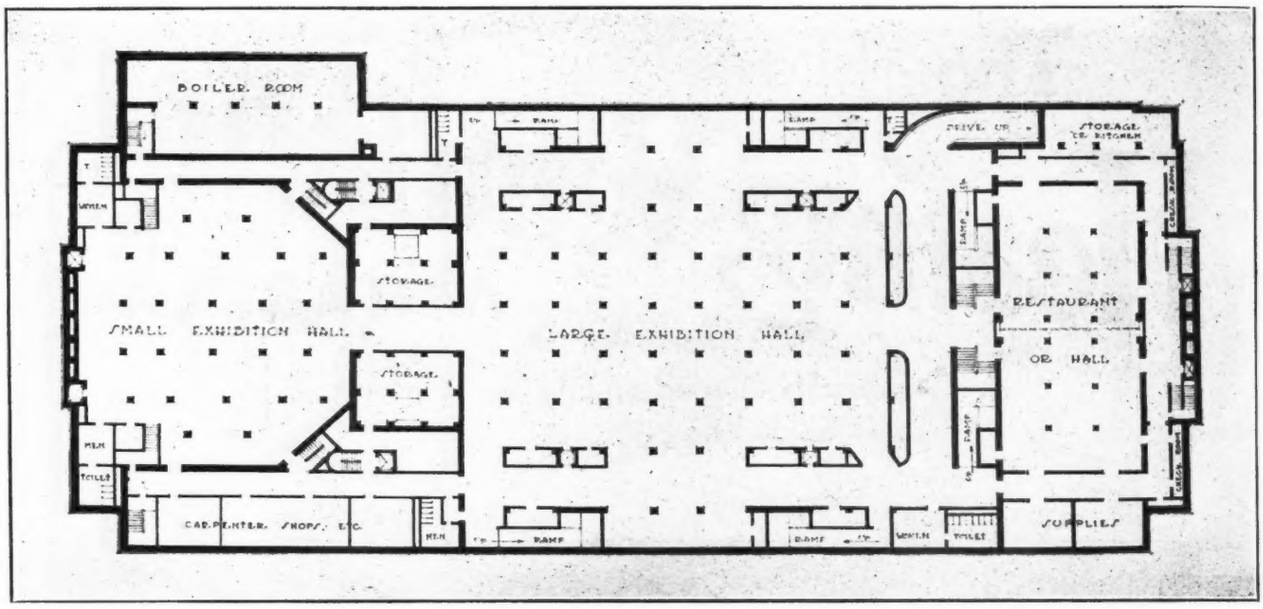
Details of an Installation Requiring 413,000 Cu. Ft. of Air per Minute, Cooled by 3,000,000 Gal. of Well-Water per Day

By S. C. Bloom

(From a paper presented before the Chicago Section of the American Society of Refrigerating Engineers)

SHEER magnitude marks the Minneapolis Auditorium not only as the outstanding example of its type in this country to-day, but as a landmark in the progress of the cooling and ventilating art. It is the first municipal auditorium in which adequate provision has been made for the comfort of its occupants in hot weather.

Since the problem of making municipal auditoriums self-sustaining through their earnings—whether municipally-operated or leased to private interests—is a serious one, it is equally important that comfort conditions in hot weather be taken into consideration. In this way the utility of such structures can be spread over the full twelve months of the year, instead of nine months or less, depending on local climatic conditions. In point of fact, it is easily conceivable, although yet to be demonstrated in actual practice, that the demands for use of such structures in hot weather may exceed those at other seasons of the year, simply because it affords a place where people may be comfortable.



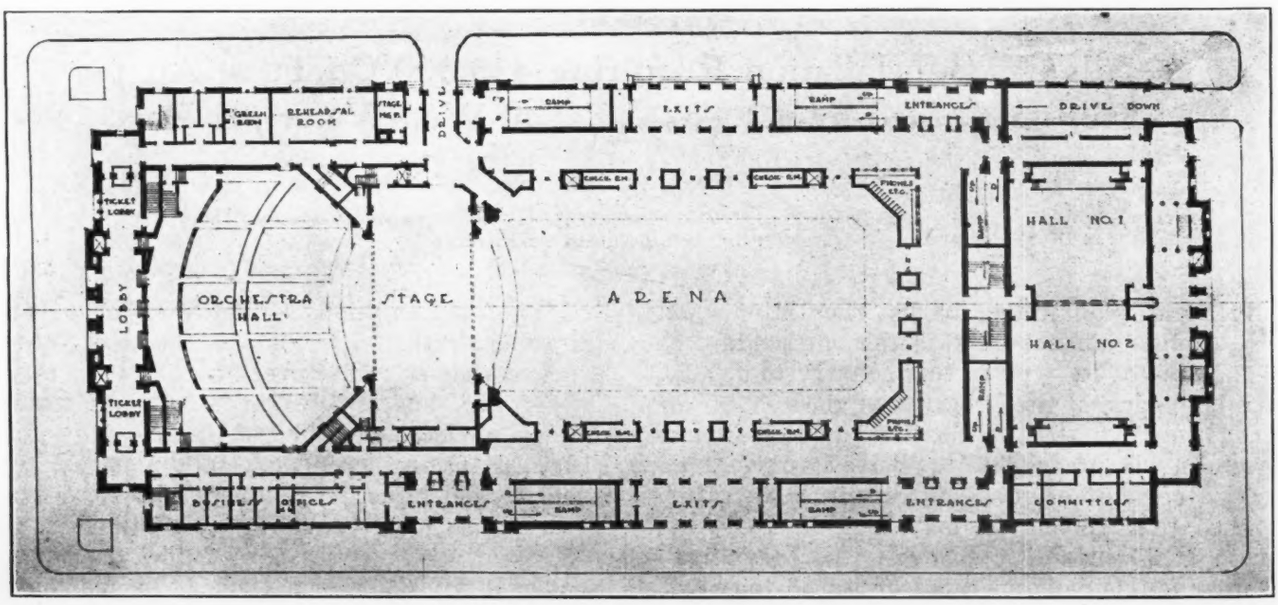
Basement Plan, Minneapolis Auditorium

DIMENSIONS SHOW ENORMITY OF THIS PROJECT

Before launching upon a description of the system and equipment for cooling and ventilating this huge structure, a brief outline of some of its striking proportions and physical details will be of assistance in visualizing the enormity of this project. The completed structure, occupying two entire blocks, will measure 564 ft. x 233 ft. and 140 ft. from sidewalk to roof peak. The combined seating capacity is 18,100, and the cost of the completed building, including site, furnishings, and architects' fees, $5,000,000.

STRUCTURE DIVIDED INTO THREE MAJOR UNITS

For purposes of flexibility in use, to accommodate exhibitions, conventions, and other assemblages of various size, the structure is divided into three major units. The central unit (Section A) measures 233 ft. x 320 ft., with a Main Arena 220 ft. x 264 ft. The main floor and balcony will seat 11,000 people. The cost of this section, including site for the entire building, furnishings and fees, was $3,150,000. It is entirely free from all posts or obstructions to vision, and at the end, adjoining "Orchestra Hall" (Section B), has a stage 50 ft. x 110 ft., with a proscenium opening 70 ft. x 42 ft.; the stage floor is completely trapped. An electrically-operated rising and lowering orchestra pit will accommodate 85 musicians. From arena floor to ceiling measures 85 ft. The steel trusses carrying the cement tile roof are of the Warren type and the suspended ceiling has a span of 230 ft. Instead of being described as of structural steel construction the building might more aptly be classed as "bridge work." The attic space in which the steel trusses are concealed is approximately 40 ft. high. The gutters for taking care of rain-



First-Floor Plan, Minneapolis Auditorium

fall are of ample size to go canoeing in comfortably, since they measure 6 ft. wide x 5 ft. deep.

Concealed lighting is employed throughout, including the use of three colors, red, white and blue, for effects desired.

The basement of the entire building will serve as an exhibition hall. Patrons use ramps exclusively for ingress and egress; there are no stairs. Generous vomitories provide for convenient access to the various portions of the balcony and for quickly emptying them. Ramps are also provided for trucking of exhibits directly into the basement. The Main Arena will be fitted with a $100,000 pipe organ, funds for which are now being raised by popular subscription.

DETAILS OF ORCHESTRA HALL

Orchestra Hall (Section B) is designed for a seating capacity of 3600 and consists of main floor and balcony, with exhibition hall in the basement, which can be used separately or in conjunction with that beneath Section A. The stage previously referred to may be used as part of either the Main Arena or Orchestra Hall, as desired. For large conventions and the like, the stage may be made common to both sections, thus giving approximately 15,000 occupants a clear view of the stage. Soundproof curtains at either side and in the center of the stage provide for the flexibility of use referred to earlier in this article.

THE "SMALL HALL WING"

At the other end of Section A, the "Small Hall Wing" will be built, consisting of several small halls for small conventions and committee meetings, each hall being provided with its own stage. This wing will also contain a restaurant in the basement. The seating capacity of the small hall wing will be 3500. Section B and the Small Hall Wing, completely equipped, and including architects' fees, will cost $1,800,000.

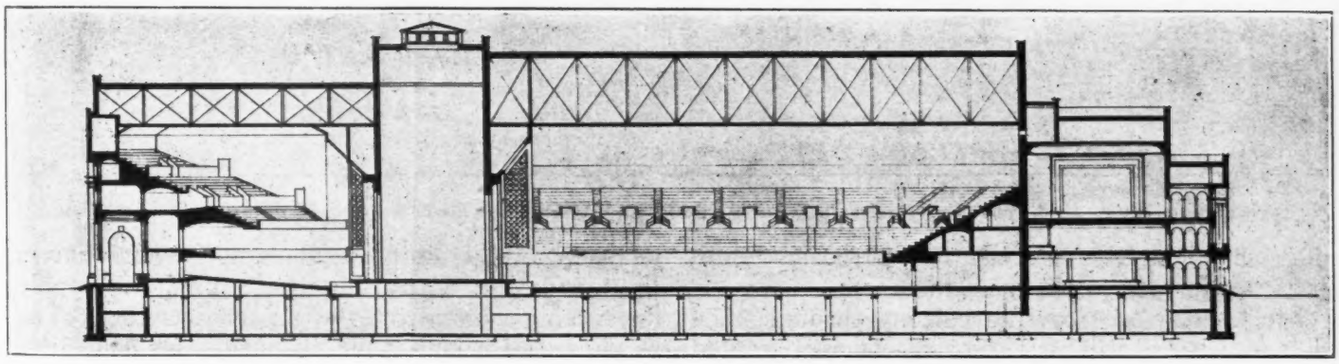
The exterior of the building is composed of granite base and granite steps, with Bedford stone facing above and decorative panels in terra cotta. The main floor is approximately 3 ft. above sidewalk level.

BUILDING HEATED BY TWO-PIPE VACUUM SYSTEM

The building is steam heated with direct radiation. A two-pipe vacuum system of steam circulation is used, with attic main, down-feed risers and basement return, located in pipe tunnel beneath the floor. The tunnel makes a complete circuit of the building, with cross tunnels where Section A joins the two wings. Unit heaters of recirculating type serve the entrances and exits of the arena, as well as the six committee rooms in this section. Similar heaters are provided for the various rooms and lounge spaces of Orchestra Hall.

Complete automatic control of heating units and of certain dampers of the ventilating system is provided. Steam for all purposes is supplied by four 300-H.P. down-draft portable-type low-pressure boilers.

Total cost of mechanical equipment for the main unit was $669,690. The cost of mechanical equipment for Section B and the small hall wing will cost $500,000 additional, making a grand total of $1,169,690, or 23.4% of the total outlay.



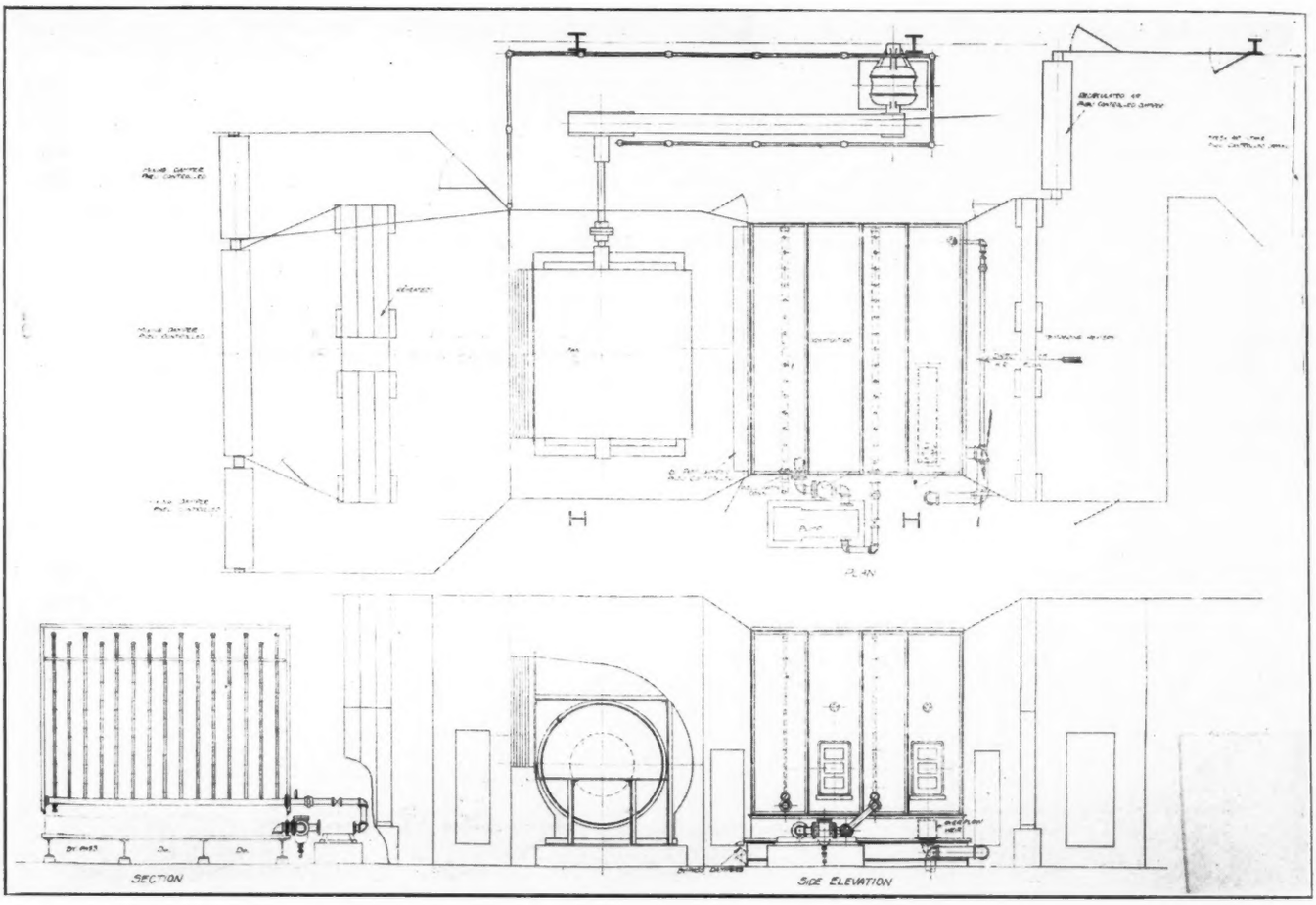
Sectional Elevation, Minneapolis Auditorium, Showing, at Left, Orchestra Hall and, in Center, Main Arena

VENTILATION EQUIPMENT COMPRISES TEN SEPARATE FAN SYSTEMS

The ventilation for the entire building consists of ten separate air-supply fan systems and an equal number of mechanical exhaust systems, each system constituting a complete unit in itself. Eight of the air supply units are equipped for air cooling; the other two supply air to corridors and main group chorus rooms in the dressing-room sections of the arena.

The mechanical exhaust systems provide for the removal of air from dressing rooms, toilet rooms, janitor closets, utility or work rooms and from projection rooms.

The Main Arena (Section A) is ventilated by means of four separate units to provide for flexibility and economy of operation in accordance with the density and location of occupancy at any time. The ventilation of the Main Arena is of the downward type, the supply for the balcony being introduced through twelve perforated ornamental plaster grills, each 20 ft. x 8 ft. 6 in., located in the arena ceiling. Unit No. 1 serves the north side of the arena balcony and unit No. 2, the south



Typical Fan Room Unit, Showing Recirculation Air Intake and By-Pass for Diverting Air Underneath Dehumidifier

side; each has a capacity of 72,000 c.f.m. Both units are located in the attic fan room.

Air is relieved from the balcony through 1800 gallery riser ventilators and may be recirculated or discharged to the general exhaust chamber, as desired. The duct system is so designed, cross-connected, and pneumatically-dampered for manual control, that the fans may be used as exhaust fans, the fresh air ceiling grills, in this case, acting as vent grills; also, either unit may be used singly to supply air to, or exhaust from, all the ceiling grills.

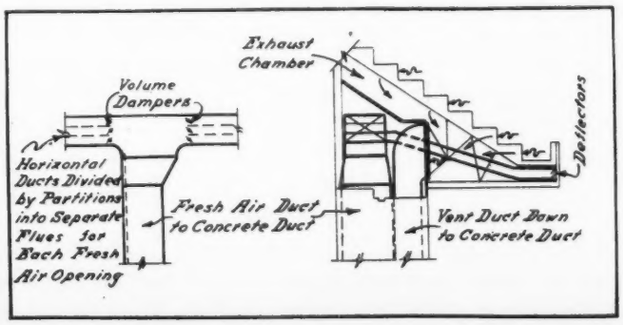
The air supply for seats on the main floor of the arena is introduced through long narrow grills in the balcony railing and vented through grills at the floor line, around the walls. These grills are connected by a duct system, concealed above the furred ceiling in the basement.

Unit No. 3, serving the north half of the arena, main floor seats, has a capacity of 58,000 c.f.m., and Unit No. 4, serving the south half, has 53,000 c.f.m. capacity. Both units are located in the basement and the exhaust air may be recirculated entirely or in part, the balance being carried up shafts to the general exhaust chamber in the attic.

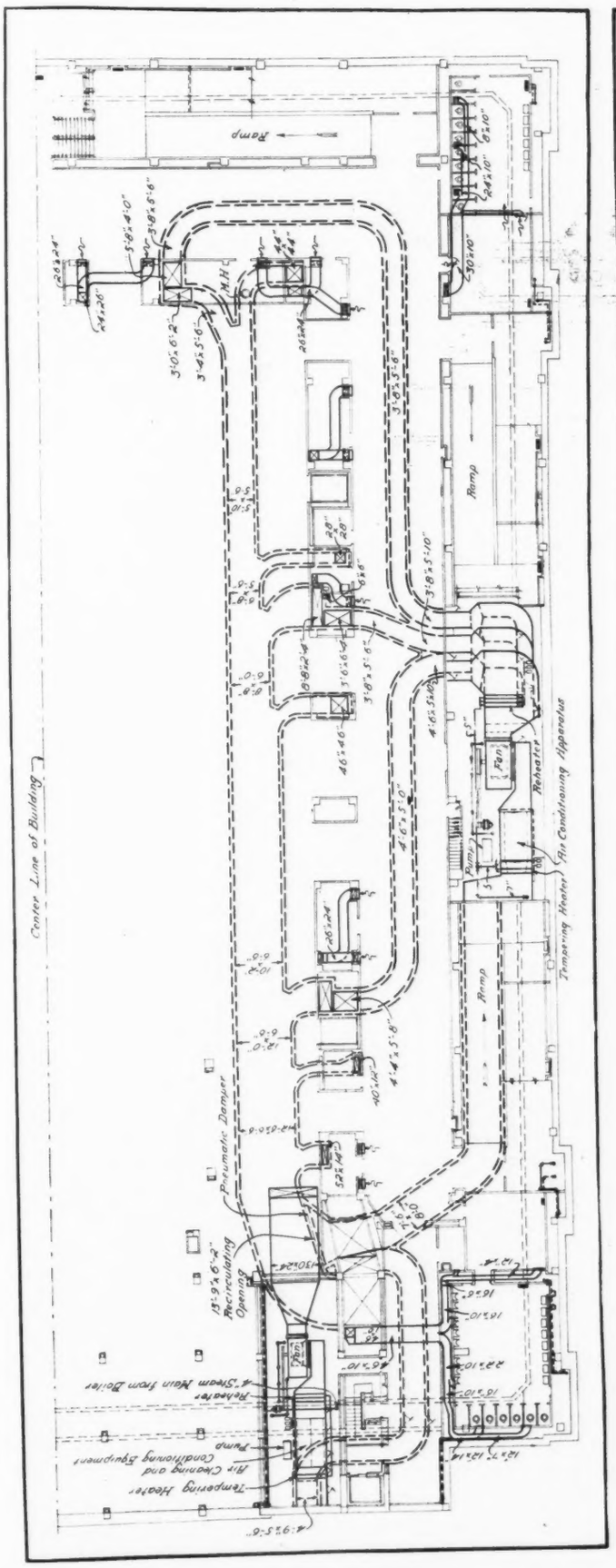
The total air supply to the main arena is 255,000 cu. ft. per minute.

The exhibition hall, in the basement of Section A, is supplied by Unit No. 5, having a capacity of 26,000 c.f.m., and is based on a 20-minute air change. Air is introduced through combination light and vent fixtures in the ceiling, the supply duct being concealed by the furred ceiling. The exhaust is through openings near the floor line, around the outside walls, with a concrete duct system connecting to a vent shaft to attic exhaust chamber, with provision for recirculating all, or any part of the air.

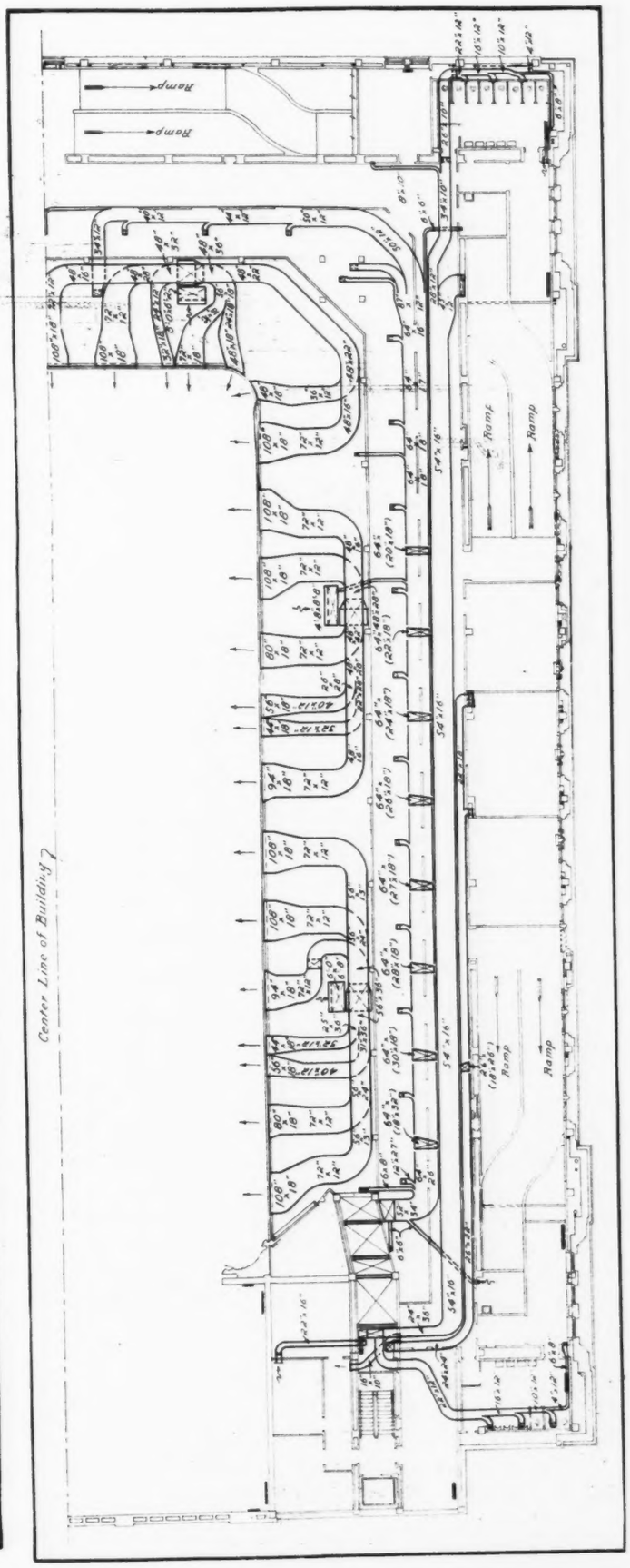
In general, the ventilating system for Orchestra Hall (Section B) is the same in type. Unit No. 6, having a capacity of 16,000 c.f.m., supplies the exhibition hall in the basement of this section and is located in the basement. Unit No. 7 has a capacity of 100,000 c.f.m. and is located in the Orchestra Hall attic fan room. This will supply air through openings in the ceiling and large wall outlets. Air is exhausted through mushroom ventilators under the seats in both main floor and bal-


Exhaust Chamber
Volume Dampers
Deflectors
Horizontal Ducts Divided by Partitions into Separate Flues for Each Fresh Air Opening
Fresh Air Duct to Concrete Duct
Vent Duct Down to Concrete Duct

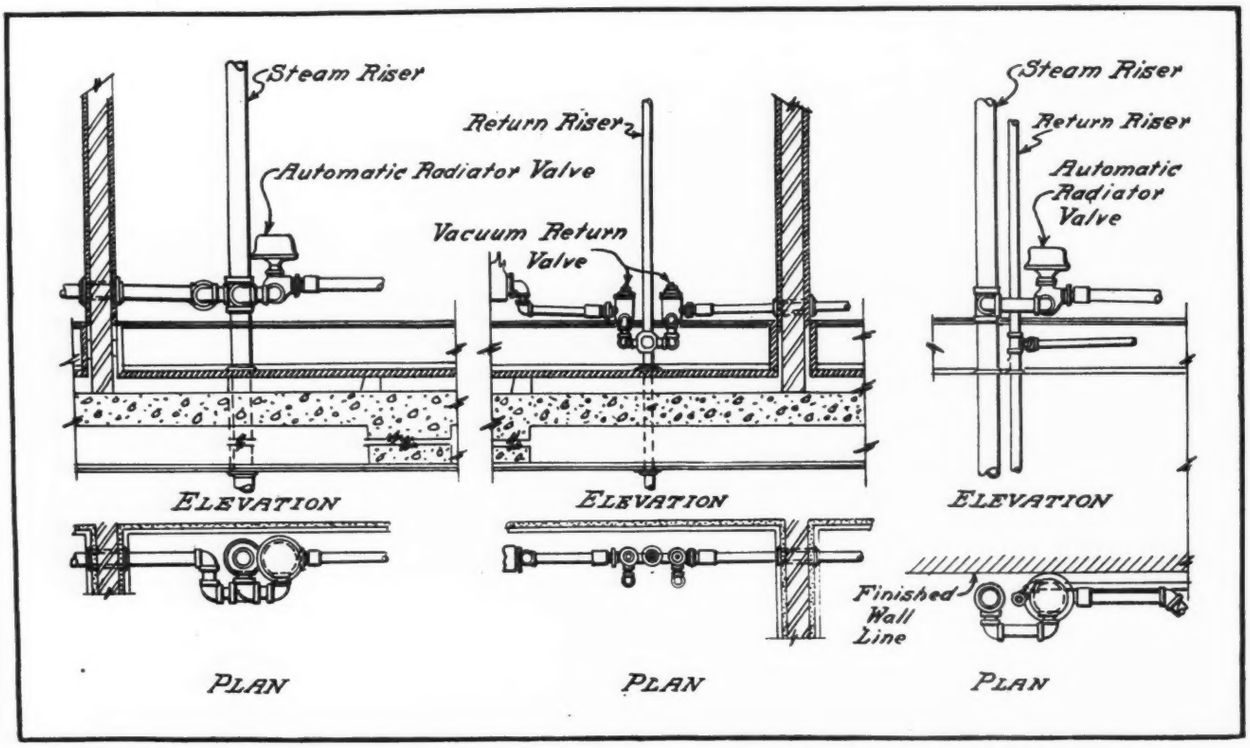
Typical Elevations of Vent Duct, Fresh Air Duct and Branches to Fresh Air Openings



Part Plan of Basement Showing One-Half of Arena Heating and Cooling Equipment, Including Concrete Ducts for Supply and Return Systems



Part Plan of Second Floor Showing Air Inlets Introducing Air at the Edge of Balcony Railing to Supply Main Floor Seats



Typical Radiator Connections With Supply and Return at Opposite Ends and at the Same End

cony openings. It is then returned through a shaft to the attic and may be recirculated in any part desired or thrown to outside as may be required.

Unit No. 8, having a capacity of 16,000 c.f.m., located in the fifth floor Orchestra Hall fan room, will supply air to outlets in entrance lobby, foyer and entries from foyer to main auditorium in Orchestra Hall. There is no provision for air recirculation in connection with this system.

DESIGN OF VENTILATING UNITS

Each ventilation unit consists of a squirrel-cage fan, belted to a variable-speed, slip-ring motor, the fan drawing air through a Bloom washing dehumidifier of special design, in which the recirculated air is washed, and cooled in summer. The fresh air taken into the system is by-passed underneath the dehumidifier and thoroughly mixed with the cooled, washed air in the fan. It was originally intended to provide air filters for removing the usual dirt contained in the fresh air, but on account of insufficient funds, and the probability that the air would be fairly clean in the location of the building, the installation of filters has been deferred until experience has indicated their necessity. If they are required, they will be added when the balance of the building is constructed.

Vento heating surface is provided for tempering the air in winter before it enters the air-washing apparatus, and similar heaters are provided to reheat the air before introduction into the building. Steam supply to all heaters is under thermostatic control and by-pass dampers around the reheaters are also controlled; the air is introduced at about the room temperature which is to be maintained during the heating season. In winter, automatic control of the amount of fresh and recirculated air also provides means for humidity—a very desirable feature from the standpoint of comfort and health.

Cooling is accomplished by washing the air with cold well-water. In this respect, Minneapolis is endowed with an asset of no mean consequence. It is underlaid with a water-bearing formation, easy to reach and abundant in quantity. The temperature of this water is 49½° F. in the ground. It is pumped from two wells, each 800 ft. deep, with a 20-in. casing down 250 ft. and a 16-in. bore through rock the rest of the way. The level of water in the wells without pumping stands 60 ft. below grade. When pumping their maximum capacity, the level stands 80 ft. below grade, representing a drawdown of only 20 ft., which reflects the abundance of the supply. This water is pumped direct to a series of spray nozzles in each of the air washing dehumidifiers, reaching them at a temperature of 50° F.

This fresh, cold, sparkling water, sprayed in a veritable cloud burst, purifies and cools the recirculated air, absorbing odors and organic matter which otherwise would limit the amount of air which could be recirculated. This water, immediately after being used for air cooling and washing, goes to the sewer.

In the concluding section of this paper, Mr. Bloom will explain the use of "effective temperatures" in determining the load of a cooling system and will give a comparison of the system as installed in the Minneapolis Auditorium with a carbon dioxide mechanical refrigerating plant of corresponding capacity.

A Proposed Set-Up for Testing Automatic Roof Ventilators

Why the "Wind-Tunnel" Method is Favored, Sizes of Ventilators to Be Tested and How Ratings Should Be Expressed

By George D. Beals

AUTOMATIC roof ventilators are a class of mechanical equipment which have not received the amount of study and research they deserve at the hands of scientific men for purposes of standardizing practice in this field. True, several of our engineering schools, the U. S. Bureau of Standards, and many private organizations have conducted more or less complete tests of some of the types on the market and have distributed volumes of data on the widely-varying results obtained. These tests, however, were almost exclusively of a comparative nature to determine relative efficiencies between a few types for some particular and immediate purpose, and were not undertaken in an effort to standardize upon some acceptable method by which all types might be tested and accurate comparisons made.

EXPERIMENTAL tests conducted on automatic roof ventilators in recent years, among which may be mentioned those investigations by the Kansas State Agricultural College and the U. S. Bureau of Standards, have contributed two great services to the engineering profession.

First. Such tests have been instrumental in bringing attention to this class of ventilating equipment, not as a crudely constructed storm-cap whose sole function was to keep the elements out of a vent stack, but as a carefully-designed piece of technical apparatus of such importance that great care and thought must be given to a choice between the several types offered on the market.

Second. They have set forth many of the underlying principles of design necessary to permit an intelligent criticism and choice of the various makes so that less dependence need be placed on biased catalog treatises and manufacturers' "sales talk."

None of these tests, however, has been conducted for the purpose of establishing a standard code for the testing and rating of roof ventilators. Considerable work remains to be done along lines of standardization in this field and whole-hearted co-operation must be given by the industry toward the attainment of this goal.—GEORGE D. BEALS.

The claims of some manufacturers are so extravagant, and the arrangement of test equipment used subject to such criticism, that it is necessary, for the protection of manufacturers and users alike, that concerted action be taken to determine upon standard testing apparatus and uniform methods of rating. To this end the writer submits the following observations from his experience, and offers a few suggestions in regard to ventilator testing which he hopes may stimulate some discussion and bring about definite action.

The two accepted methods by which ventilators are subjected to test at the present time are the "wind-tunnel" tests and the tests made on units installed under actual working conditions. There are several exponents of the industry who believe that proper considerations of wind velocities, wind directions, temperature differences, and operating efficiencies only can be obtained with a working condition test. Although weight must be given these considerations, it seems to me that, for accurate scientific testing and comparable reports, the "wind-tunnel" method is the best practical test.

The following reasons lead to this conclusion:

1. A laboratory set-up of test equipment can be duplicated at any time or place, whereas the circumstances under which a working condition test is made are rarely the same or possible of duplication.

2. A working condition test, to be of any practical value, must be conducted over a long period of time, so as to obtain a sufficiently extended range of the various conditions of wind velocities, etc., whereas in a laboratory test the time element is unimportant.

3. The conditions under which ventilators are installed are so varied, hardly any two being installed under identical conditions, that it seems impossible to conceive of any working test set-up that would produce results which could be placed in the hands of an engineer for his information and guidance in the selection of equipment for future projects.

Some laboratory tests conducted on roof ventilators, among which is that study made by the

Bureau of Standards, in 1920, have gone so far as to establish two efficiency factors, namely, the resistance efficiency or resistance offered to stack action by the ventilator, and wind efficiency or wind rating.

This would appear to be an unnecessary refinement, as any ventilator head offers the same amount of resistance to air passing through it, due to the wind action, as to that caused by stack action. In practical applications differences in temperature between the air in the rooms to be ventilated and the outside air, combined with static resistance of the flues, ventilator head, etc., are never similar, so that the determination of a resistance efficiency in itself is of no particular value. The amount of resistance offered to the flow of air in a ventilator head is very important, however, in the measurement of overall efficiency for a given ventilator, but, as this factor is only one of the influences which will affect the exhausting qualities of the unit, it does not call for a separate test to measure its value.

SIZE OF VENTILATOR TO BE TESTED

It is quite important that the ventilator to be tested bear a correct relationship to the proportions of the testing apparatus adopted. Obviously, a large ventilator placed close to the discharge end of a wind tunnel will show extremely inaccurate results. On the other hand, if a very small unit is tested, the measuring instruments will so obstruct the air passage that equally inaccurate results will obtain. The size of the ventilator selected for test will depend, then, upon the type of testing equipment chosen, its general arrangement, and proportions.

The data obtained from a test on any one of a series of ventilators of similar make suffice for the entire line. This is true only if the area of frictional surfaces varies directly with the area of the various passages in which air flows when passing through the ventilator. For this reason it is absolutely essential that a given line of ventilators be proportional in all their parts or else a separate test must be run on each size. This is an important point which a few manufacturers have been led into neglecting, probably because of production advantages which could be gained by varying the dimensions.

RATINGS SHOULD BE EXPRESSED IN SAME TERMS

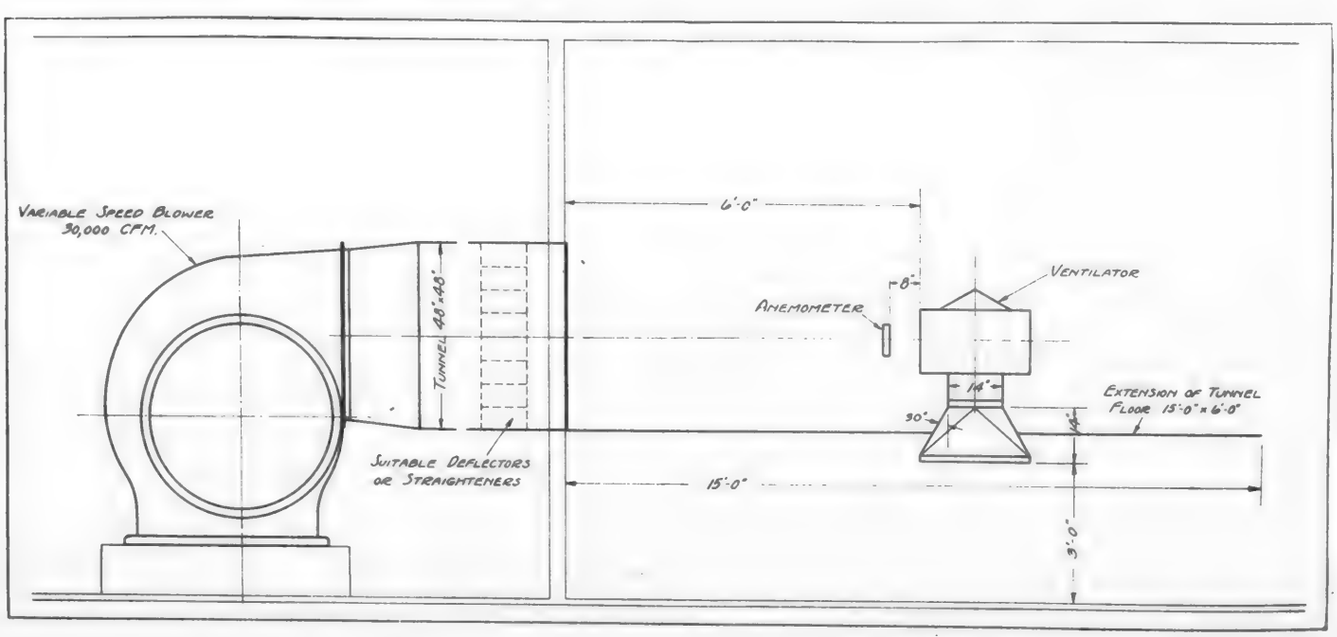
It is desirable that all catalog ratings published by manufacturers be expressed in the same terms. Whether the capacities be given in charts or tables is not so important, but it is essential that the same yardstick of measurement be used. As this type of equipment depends largely upon the passing winds for its motive power, it is logical to rate the capacities in terms of volume of air displaced in cubic feet due to wind velocity in miles per hour.

The anemometer is the most satisfactory device for the measurement of air velocities in ventilator testing. This is a very delicate instrument requiring frequent calibration, but, as the better grades will measure velocities as low as 100 ft. per minute, up to velocities of approximately 20 miles per hour, its use is best suited for this work.

PROPOSED TEST EQUIPMENT

The accompanying figure shows in outline a general arrangement of test equipment which the writer offers for the consideration of those interested in this subject.

A variable-speed blower, discharging into a wind-tunnel 48 in. square, is placed in a room hav-



Suggested Arrangement of Equipment for Testing Roof Ventilators

ing no direct air passage with the room in which the ventilator is to be set up. Air supply to the blower is obtained through open windows or an intake pipe connected to the outdoors. The ventilator, size 14 in., is located in an adjoining room 6 ft. away from the discharge end of the wind-tunnel, and is fitted to a transforming base as shown. This base is set into the extension of the bottom sheet of the wind-tunnel, which forms a table 15 ft. long by 6 ft. wide. The room in which the ventilator is placed must be large enough to eliminate all influences of counter drafts and eddies. Windows and other outlets must be opened, so as to allow the free and rapid escape of the air.

Wind velocities are observed by an anemometer located in a vertical plane 8 in. in front of the ventilator, and in a horizontal plane coinciding with the center line of the wind-tunnel and the ventilator. It may be deemed advisable to employ at least three anemometers for this purpose, the effective wind velocity to be taken as an average of the three readings. To obtain the velocity of air exhausted by the ventilator, the square section of the transforming base is divided into nine equal areas and an anemometer reading taken in the center of each of these areas. These nine readings are averaged and the result used to calculate the effective velocity induced in the eduction tube of the ventilator.

Care must be taken to see that the temperature of air in the eduction tube and in the room is the same, so as to prevent effects of stack action. Corrections should be made to rate all capacities at a temperature of 68° F., a barometric pressure of 29.92 in. of mercury, and 50% relative humidity.

The chief advantage of this testing set-up is that the air inlet to the ventilator is not affected either favorably or adversely by discharge or suction influences of the blower. Another advantage is that such an arrangement makes unnecessary a long inlet pipe to the bottom of the ventilator, with its resistance cutting down the volume of air handled. Then, too, by setting the ventilator at least 6 ft. from the mouth of the tunnel and measuring the wind velocity at the ventilator, the air is permitted to expand before it reaches the anemometer and a more accurate wind-velocity measurement secured. The readings obtained in the intake base to the ventilator give the net velocities from which the capacity of the unit may be calculated directly, subject only to corrections for standard air.

This set-up tends to duplicate an actual installation made under ideal working conditions where all disturbances due to variable velocities and directions of natural winds are avoided, stack action is eliminated, static resistances are removed, and all practical installation vagrancies overcome.

The foregoing suggestions for choice and set-up of testing apparatus are not given with the thought that it is a perfect arrangement for test work of this character. Rather, it is offered with the desire that it may be constructively criticized and thus lead to some standard methods which will prove acceptable to the industry.

Ammonia Versus Carbon Dioxide as a Refrigerant in Air Conditioning Work

IT cannot be too strongly emphasized that ammonia plants have no place in auditorium or theatre-cooling work, or in any place where there is a high population density. The single exception to this rule is where the refrigerating machinery is completely isolated from the building and a brine circulating system interposed between the refrigerating machinery and the air-cooling apparatus.

Carbon dioxide, with its large background of experience in continental Europe and, to a lesser extent, in this country, is the most desirable refrigerant at hand for air-cooling work. There are others which are being advanced, but machines employing them have yet to be tested in the crucible of experience, for when all is said and done, Time is the great factor establishing the worth of any equipment.

At present, the principal characteristic advanced in favor of carbon-dioxide is that, in case of a break in the machinery and the escape of the refrigerant, there is no danger from panic. It is only fair to say of ammonia systems that with the methods of applying the refrigeration to air cooling, there is really no danger to a theatre audience from the standpoint of suffocation from ammonia fumes. The cold water, which is sprayed into the air for cooling, and is subsequently recooled and recirculated, has a tremendous affinity for ammonia. Water will absorb 1700 times its own volume of ammonia gas.

The difficulty is that if a leak in the ammonia system occurred, the water would gradually increase in strength of ammonia content, the odor in the theatre would gradually become stronger, and then some one would get the inspiration to flee. This would be a signal for a panic. Fortunately, no such calamity has occurred in this country, and it is to be devoutly hoped that it never will, as it would be a setback to the art of cooling for ventilation which it would take many years to live down.

It should be added in passing that the impetus given the carbon-dioxide refrigerating machinery business by its ever widening use in theatre-cooling work, is resulting in developments of a nature which will materially reduce the initial outlay and operating expense of equipment for cooling work. —S. C. BLOOM *before the Chicago Section of the American Society of Refrigerating Engineers.*

Some Thoughts on the Combustion of Oil

The Production and Utilization of Heat in the Domestic Boiler and Furnace

By P. E. Fansler

Associate Editor, THE HEATING AND VENTILATING MAGAZINE

IN a previous article on this subject an attempt was made to identify many of the prevailing ideas regarding the technique of oil combustion that are based upon unsound foundations, and to suggest the desirability of adhering to fundamental truths in telling the story of the domestic oil burner to the public.

As a continuation of the discussion of the so-called atomization of oil as a preliminary step to its gasification, it is interesting to consider how the breaking-up of oil into minute globules aids in the gasification process by tremendously increasing the surface of a given quantity of oil. We are greatly concerned with surfaces, as they are of prime importance when considering heat transfer from a radiant body.

One pound of 28°-32° oil fuel will exactly fill a sphere having a diameter of 3.92 in., and the sphere will have a surface of 48.28 sq. in. Quite a sizable globe.

Assume, for no particular reason, that this globe of oil is "atomized" into little globules with diameters of 1/200 in., or, in decimals, 0.005 in. The grotesqueness of speaking, in literal terms, of "atomized" oil, is evident when we put down beside this decimal the figure representing the diameter of a carbon atom—it is 0.000,000,006 in. And an atom of oxygen is slightly smaller. The finest mist that can be produced by the "atomizing" burner does not begin to approach molecular, let alone atomic, dimensions.

But, to get back to the 0.005 in. globules—there would be 484,000,000 of them in the pound of oil, and their aggregate surface would be *over thirty-eight thousand square inches.* Breaking up the 3.92 in. globe of oil into the 1/200-in. globules has increased the surface nearly a thousand fold.

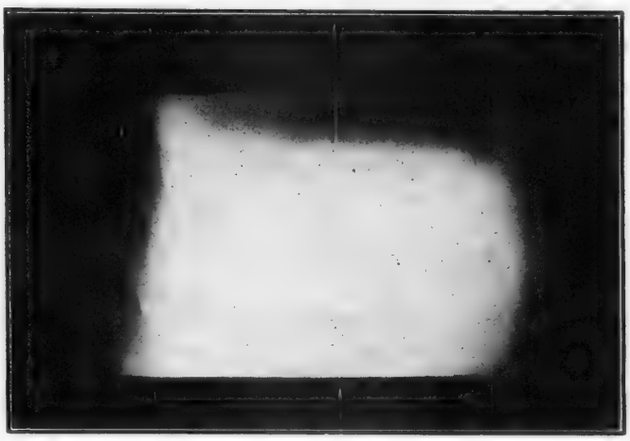
It is difficult to attempt to show the flight of such a globule of oil, as pencil or pen lines do not lend themselves to such portrayal. But a visualization of what happens is comparatively easy, if only we adhere to known physical and chemical facts.

PICTURES OF ACTUAL FLAMES AID IN STUDY

A visualization of this may be assisted by studying the beautiful flame picture on page 64. Here is clearly shown the cone of atomized oil and air issuing from the nozzle, in this case with a velocity of about 400 ft. per second. Naturally, as the cone spreads and the oil globules change from the liquid to the gaseous state, the velocity at any point decreases rapidly.

At the point where combustion is initiated, it is evident that conditions are ripe for sustained combustion; that is, heat is being generated at a higher rate than it can be dissipated. So combustion will tend to spread through the mixture, with a velocity that could be computed if the combustibles were simple gases. As they are of complex composition, however, such figures must be approximated, and may be taken as of the order of 4 ft. per second.

So, if combustion is spreading upward through the cone at some such rate, it is obvious that the zone of combustion will reach up to the point where



Photograph Made Through Fire-Door Opening, Showing Typical Heat-Production at High Rate by Intermittent Burner

the velocity of the downward moving combustibles just equals this rate of flame propagation. If a little more pressure is put behind the primary air, the flame will move away from nozzle, and if the air velocity is reduced, the flame will creep toward the nozzle. Control of the point of combustion, therefore, is possible within certain limits.

ALL PHASES OF COMBUSTION PROBLEM REDUCE TO BASIC PRINCIPLES

In analyzing combustion problems where other methods of atomizing are used (or where oil is gasified directly), it is simply a matter of studying the application of fixed principles to varying practices; one burner may provide for atomization by throwing the oil from the periphery of a spinning disc or cup; another by churning the oil and air together and ejecting the resulting "froth" from a nozzle.

An accurate copy of the common dressing-table atomizer is the basis for one burner, and in another mechanism, by forcing oil, or oil and air,

through a small orifice the one is broken up and mixed with the other. A Venturi tube, which is simply a tube with a contraction or "throat," has the property of causing an increased velocity at the throat, and oil introduced at this point is atomized, due to the high velocity of the air.

It is pretty much like the nine ways of skinning the cat—there are many ways of solving the same problem in this case, and the success that may attend any specific method largely will be due to an appreciation of the physical and chemical laws that govern the various phenomena.

Flame from "Gun-Type" Burner with Revolving-Cup Atomizer

PROPER UTILIZATION OF THE PRODUCTS OF COMBUSTION

Having brought about the combustion of the gaseous hydrocarbon evolved from the liquid fuel, we find that the oxidation has produced new chemical compounds plus a given quantity of heat. It is this heat that we desire to utilize in the boiler or furnace through a thermal transformation, whereby as much as possible of the heat of combustion is passed on to the heating medium—water, steam or air.

The effectiveness of this transformation depends upon the design and construction of the boiler or furnace. It was pointed out nearly two years ago, in THE HEATING AND VENTILATING MAGAZINE, that the general introduction of the domestic oil burner propounded a problem to the boiler manufacturers in requiring the design of boilers specifically adapted to the combustion and firing characteristics of the present-day oil burner. The verity of this argument was, at that time, disputed by representatives of several manufacturers, with the intimation that any boiler designed for the use of coal was good enough for oil burning without any change in design. The mere fact that these same manufacturers have since announced special newly-designed oil-burning boilers seems to indicate that the thoughts expressed in these articles on oil-burning boilers, in the main, were correct.

Two striking photographs have been secured through the courtesy of Frank Fischer, president of the Grant Oil Burner Corporation, showing in a vivid way one essential difference between the normal coal fire and the normal oil-burner flame.

A Typical Coal Fire Four Hours After Coaling
This "lazy" fire represents average conditions of heat production when burning coal.

HOW HEAT IS PRODUCED WHEN COAL IS BURNED

If we inspect a coal fire burning in a domestic boiler, we will probably find that there is a bed of ash from 1 in. to 3 in. deep covering the grate, then a bed of incandescent coal covered with black coal. Blue flames flicker from the holes between the pieces of coal, perhaps 3 in. long. If "egg" coal is used, there will be comparatively few holes and flames, and if fine coal is fired, the entire top of the coal bed may appear to be ablaze. These flames are seldom continuous, flickering up and dying out. The temperature at the tips of these flames may be as high as 3000° F., but the average temperature a foot above the coal would be very much less. The boiler is, in effect, a retort, roasting the volatile gases from the coal, mixing them with air, heated by its passage through the red-hot fuel bed, and allowing this mixture of gas and air to burn above the top of the coal bed with practically complete combustion. The coke resulting from this "coking" action burns in the fuel bed, and transfers a considerable amount of radiant heat directly to the walls of the combustion chamber adjacent to the fire.

It may be that the bed of ash is so thick as seriously to retard the flow of air through the fire, in which case considerable gas may escape unburned. A flue gas analysis of such a case might show a comparatively small amount of CO_2, an appreciable percent of CO and perhaps free carbon. Under these conditions, if air could be admitted to the combustion chamber above the top of the fire in such a manner that the resulting temperature of

the incoming air and the uncombusted gases is *above the point of ignition of this gas,* it would combine with the CO to form CO_2, and with the free carbon, C, to form CO_2, thus increasing the combustion efficiency. If, however, the incoming air cools the gases to *below their ignition point,* as it frequently does when the boiler is operating at low load, or if the incoming air does not mix intimately with the gases requiring oxidation, no good will result.

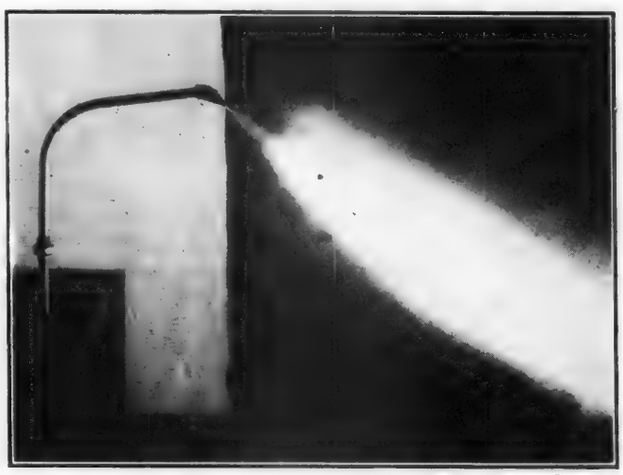
HOW HEAT IS TRANSFERRED WHEN BURNING COAL

The manner in which heat, produced by the combustion of coal in the combustion chamber, is transferred to the water in the boiler, must be given careful consideration when designing a boiler. The fire box, that portion of the combustion space below the fire-door sill, is usually filled with coal, the greater portion of which is at a red heat or higher. That part of the coal in contact with the boiler walls is capable of passing heat at a high rate to the iron, and through it to the water in the lowest part of the water-leg. The greater part of this heat is in the form of radiant energy produced by the high surface-temperature of the red-hot coal. It strikes the rough, black surfaces of the boiler, and is absorbed and passed through the iron. Here we have ideal conditions for heat transfer. The radiant energy is produced at a high rate, due to the almost incandescent surfaces of the coal, and the boiler surfaces are almost the ideal for the absorption of radiant heat.

There is yet another way in which radiant heat is passed on to the water in the boiler. Above the top of the fire surface is an area of the walls of the combustion chamber, and, in some types of boiler, less or greater portions of the secondary surface, that are directly "in view" of some portion of the fire surface. As radiant energy travels in straight lines at right angles to the surfaces emitting it, these boiler surfaces become available in absorbing this radiant energy. It must be remembered that a body need not be incandescent or red hot to be capable of giving off radiant heat. Any body that is above absolute zero gives off radiant heat in proportion to its temperature and to its area, so that, in the boiler, coal on the surface of the fire may not be red hot and yet may give off radiant energy. However, the hotter it is, the greater the rate of emission, and so, when the surface is white-hot, as it is at least a portion of the time that the boiler is being forced, the heat emission is very high. It is obvious, however, that this condition is not the normal one in the operation of the average house-heating boiler under ordinary winter conditions. For this reason, the transfer of radiant heat may play a comparatively small part in such operation.

HOW HEAT IS PRODUCED WHEN BURNING OIL

If we now consider the same boiler fired by a typical oil burner, we begin to see the reasons why they are not ideally related. No matter what the shape of the oil-burner flame, or whether it comes from a "pot" or a nozzle or a disc, when the burner is adjusted to the flame best suited to the boiler, the entire combustion chamber, to a greater or less degree, is filled with flame. Assuming that the flame extends down to the grate level, which it should, we first find that the combustion chamber is larger than the net combustion chamber when burning coal, by the addition of the space occupied by the coal. In some cases, where the burner is of the jet type, the flame will be produced in the ash-pit, which has been lined with fire brick. This, again, adds to the volume of the combustion chamber. Under these conditions, the entire volume of the boiler up to the crown sheet practically may be filled with a swirling flame. While it is extremely difficult to make even an approximation of the radiant energy emitted from this flame, experiments in the laboratory indicate that it is at least ten times that given off by the Bunsen flame of the gas burner. Thus, utilization of the radiant energy from such a flame is a matter of considerable importance.



A Beautiful Photograph of a Flame from Nozzle
The line of demarcation between the gun of atomized oil and the flame is clearly shown.

Now it is popularly supposed that "heat travels upward." That is because we nearly always think of heated air, or water, as heat. These, by virtue of their lower density, tend to rise above colder air or water. But in the case of radiant heat, we find that it travels downward as well as upward; it does not heat the air through which it passes, nor is it absorbed by most gases to any appreciable degree. Consequently, any point of flame in a combustion space gives off radiant heat that travels in all directions, as from the centre of a sphere. Any flame surface emits radiant energy that travels at right angles to its plane. As it is impossible to maintain a flame with fixed surfaces, either as to area, temperature or shape, the difficulty of determining radiant emission is evident. But it is certain that every surface of the boiler that can "see" a bit of the flame is the recipient of some of this radiant energy.

(*Continued on Page* 68)

How to Figure Infiltration

Effect of Wind Velocity and Direction, Tightness of Window, Storm Sash and New Types of Construction, and Other Factors

By C. F. Wolfsfeld

IT is not so very long ago that the average heating engineer dismissed the problem of computing the size of a radiator by dividing the cubic contents of the particular space by 30, 40, 50 or some other "tried and true," but nevertheless arbitrary, factor. In the inevitable march of scientific progress, the designer was compelled to realize that the area of glass, wall, roof and floor exposed to outdoor conditions, or to low or high temperatures, or to dry or moist atmospheres, was a paramount factor in determining the amount of heat to be supplied. He further realized that some allowance must be made for orientation; this he has done, also more or less arbitrarily, by adding 10%, 15%, 20% or 30% to the radiation as computed.

One of the factors that entered fairly recent methods of computation was the "air change" computation. This computation assumed that the leakage of fresh cold air into the room from without caused the entire air within the room to be displaced within one hour. For very large rooms this assumption resulted in oversize radiation, and in small rooms, with long walls exposed, the opposite effect was experienced.

Cognizant of the fact that the "air change" factor depends entirely upon the character of construction and area of walls, windows, etc., the engineer has set to work to determine by actual test just how much outside air the various forms of construction will pass under differing conditions of air velocity.

While the A.S.H. & V.E. Research Laboratory already has accumulated a wealth of information on the amount of air infiltration in cubic feet of air per minute for each lineal foot of window crevice, for various types of windows, plain and weather-stripped, the laboratory is planning to carry its experiments to existing buildings of early, as well as the more recent, types. Modern engineers are rapidly abandoning the air change computation in favor of the more scientific infiltration method.

STANDARDS OF WINDOW TIGHTNESS

From the standpoint of construction, the perfect window is one that is absolutely air tight. Such construction would eliminate the infiltration heat loss. However, a room built of absolutely tight walls, windows and doors would be unfit for habitation and would ultimately cause suffocation of its occupants.

The question then suggests itself: "On what shall the heating engineer base his computations, tight windows, leaky windows or windows partly open?" It is impracticable and wasteful to design any heating system so large as to make up for a faulty construction that leaks excessive amounts of air. Neither can the system be expected to compensate for open windows and heat outdoors.

The answer to the foregoing question lies in the use to which the space to be heated is to be put. To illustrate, assume a space to be used as an office to be occupied by two persons. Ideal construction for this case would allow a leakage of 2 x 30, or 60 cu. ft. of air per minute. To heat this amount of air from 10° F. (outside temperature) to 70° F. (room temperature) would require 60x60x60x0.018, or 3928 B.T.U. per hour. Assuming a heat transmission of 250 B.T.U. per sq. ft. per hour for direct cast-iron radiation, 3928 ÷ 250, or 15.7 sq. ft. of radiation would be required for this duty.

During a working day of seven hours the two occupants require a total of 7x60x60, or 25,200 cu. ft. of air. If this office were unusually large, say 50 ft. square and 10 ft. high, it would contain enough air for the entire day, provided this air were fit for breathing purposes. In this case, any leakage from outdoors or cold spaces would cause a waste of heat.

To sum up, any amount of air infiltration beyond the minimum required for ventilation might be considered excessive.

IMPORTANCE OF PREVENTING EXCESSIVE INFILTRATION

If excessive infiltration is due to leaky windows, they should be weather-stripped, openings between frame and wall caulked or otherwise stopped up, rabbets holding glass lights painted and properly sealed. A considerable amount of air also leaks in at the sash pulley. In existing buildings that have become leaky, several coats of paint inside or outside, or both, with all openings well stopped up, will reduce considerably the infiltration through walls and trim. It is quite likely that the cost of painting will soon be offset by the saving in fuel.

The minimum amount of infiltration is dependent upon the details of construction and minimum clearances required for operation of windows and doors. Where the amount of air infiltration is below the minimum required for ventilation, heat should be provided to warm the additional amount

of cold air required to comply with the minimum. This permits the occupants to open windows and doors to bring the air up to normal requirements.

In certain types of well-designed and properly-constructed buildings, the fenestration may be such as to cause an amount of air infiltration considerably above the minimum for the number of occupants intended. While this may be considered wasteful from the standpoint of the heating engineer, it does not follow that the design or construction is faulty. The engineer should co-operate with the architect and keep the excess heat loss down to a minimum, and yet carry out the general intentions of the design.

In estimating infiltration, the leakage through the vertical openings in which the sash slides, as well as the openings at the top, bottom, and center meeting rails, is the main factor with which the heating engineer is concerned. Doors are treated in a manner similar to windows, making allowance for the tightness of same.

QUESTIONS ON INFILTRATION COMPUTATIONS

The following questions on infiltration computations present themselves:

1. In rooms having windows in more than one wall, shall infiltration be computed for *all* windows?
2. What velocity of wind shall be assumed?
3. What effect has a wind blowing parallel to a wall upon infiltration, or at an angle of 22, 30, 45 or 60 degrees?
4. Shall windows be considered as tight, leaky or moderately tight?
5. Where "exposure factors" are added to walls and windows, due to point of compass, shall they be added also to the infiltration computations?
6. Where a new type of window is contemplated, upon what shall the heating engineer base his computations?
7. Where storm sashes are used, how shall the infiltration be computed?
8. How shall infiltration be determined for steel fenestration?

HOW TO DETERMINE EFFECT OF WIND

1. The answer to the first question depends upon the arrangement of walls and windows. Assume a wind blowing at right angles to one wall and compute the total length of window crevice and door crevice through which that wind would direct a current of air. Then do the same, considering every other wall with a wind blowing at right angles to the particular wall. Assume further that a wind is blowing at an angle of 45 degrees, from all four directions, and similarly compute the total length of crevice through which each respective wind would be effective. The greatest total infiltration computed for any one wind should be the one used as a basis for calculation.

This test will prevent the error of adding the infiltration for windows in two opposite walls. Only the greater of the two would be used. (See Figs. 1 to 7.)

2. Regarding velocity, it is interesting to note that the highest probable velocity does not necessarily cause the maximum infiltration. With ordinary loose-fitting window sash, the effect of velocities above 25 miles per hour is to force the sash against the stop beads, thereby decreasing the width of crevice. This effects a decrease in the rate of infiltration. Increase in wind velocity beyond this point again causes a gradual increase in infiltration.

On the other hand, windows with fixed clearances, such as steel sash, suffer continued increase in infiltration as the wind velocity rises, the width of crevice in this case being fixed.

"AVERAGE WIND" RARELY BLOWS

In deciding upon wind velocities, engineers are considering "average" winds for the location in question. While this assumption may give acceptable results, the fact remains that the "average wind" rarely blows. The "usual high" wind at its likely temperature seems quite a rational basis for computation, although the lower "average" wind at an improbable low temperature may give very similar losses.

3. A wind blowing parallel to a wall will ordinarily effect no infiltration for that wall. In fact, it may cause leakage of air from within the room to the outside atmosphere, acting somewhat upon the ejector principle. A wind blowing directly upon a wall (at right angles to it) will cause the maximum infiltration. Winds blowing at any other angle will have effects lying between these two extremes.

In computing infiltration for winds at various angles, the wind velocity should be multiplied by the constants shown in Fig. 8, and then applied as though this reduced wind were blowing "head on."

4. It goes without saying that moderately tight windows should be assumed for most types of construction. Wood windows, although tight when new, will soon shrink and loosen up. Wood or steel sliding windows will wear to greater clearances. However, hinged or pivoted steel sash, closing into flexible rabbet linings, may be considered tight, except for wear at the hinge or pivot.

5. Factors for exposure, as ordinarily added to heating calculations, should *not* be applied to infiltration computations. At the present time, exposure corrections are applied to exposed walls, windows, etc., so as to compensate for air leakage through the construction and increase in heat transmission due to air movement prevailing for a particular exposure.

Before the advent of infiltration research, these factors embodied, supposedly, all infiltration losses, and since we are now computing the major portion of that infiltration separately, the exposure factors might be reduced.

Ultimately, when more complete data on leakage through construction become available, infiltration allowances will be divorced entirely from exposure

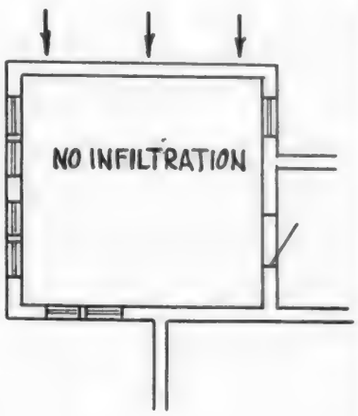


FIG.-1

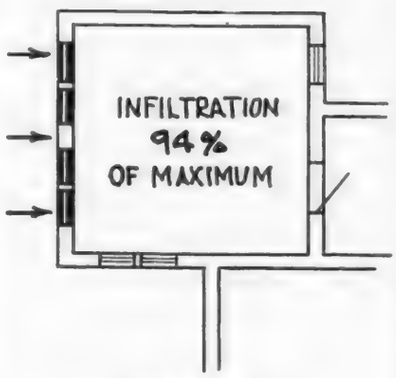


FIG.-2

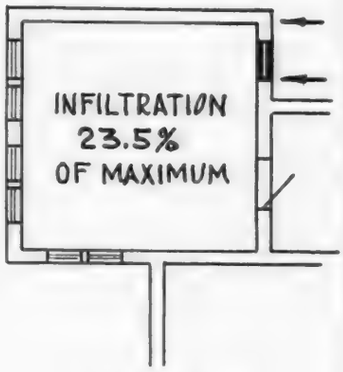


FIG.-3

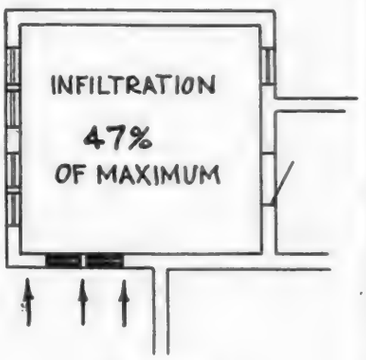


FIG.-4

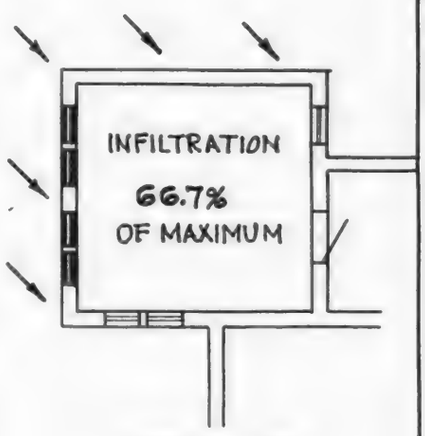


FIG.-5

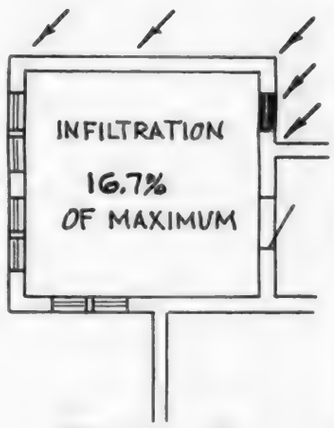


FIG.-6

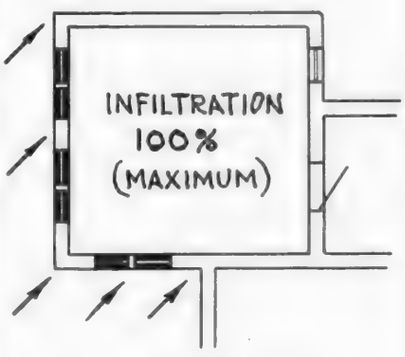


FIG.-7

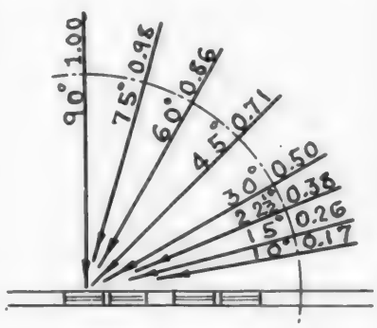


FIG.-8

INFILTRATION DIAGRAMS

FIGURES 1 TO 7 SHOW (IN SOLID BLACK) WINDOWS AFFECTED BY VARIOUS WINDS

FIGURE 8 SHOWS CONSTANTS (VERTICAL COMPONENTS) FOR WINDS AT VARIOUS ANGLES

NOTE: FOR FIGURE 7 THE INFILTRATION IS 0.71 TIMES THE "NORMAL" INFILTRATION OR SLIGHTLY ABOVE THE TOTAL INFILTRATION FOR FIGURE 2, DUE TO DIRECTION OF WIND.

C.F.W.

factors. Infiltration losses are based upon a predetermined amount of outdoor air, at an assumed low temperature, being forced into the heated space, and raised to room temperature. It is true that air at appreciable velocities has a decided cooling effect, but in the case of infiltration, the velocity is dissipated as it enters the room, resulting merely in so much cold air to be heated.

Strictly speaking, exposure should be embodied in infiltration computations by assuming individual probable high wind velocities at accompanying temperatures for each side of the building. To illustrate, this may be a 20-mile wind at 18° F., for north and west, and a 10-mile wind at 32° for south and east.

RELATIONSHIP BETWEEN WIND VELOCITY AND "EFFECTIVE TEMPERATURE"

In computing the maximum probable severe wind it would be well to bear in mind that there is an approximate relationship between wind velocity and "effective temperature." Roughly, a wind velocity of one mile per hour has a cooling effect of 1° F. That is, you would get the same cooling effect if there were no wind blowing and the temperature were one degree less. For a wind of two miles per hour, the cooling effect would be approximately 2°. To illustrate the application of this method, consider the 20-mile wind at 18° and the 10-mile wind at 32°, mentioned above. The cooling effect of a 20-mile wind being 20°, the resulting "effective temperature" would be 18°—20°, or 2°. In the case of the 10-mile wind, this temperature would similarly be 32°—10°, or + 22°.

While the difference between the "still" air temperatures is 32°—18°, or 14°, the difference between the "effective temperatures" caused by wind is 22°—(—2°), or 24°.

The combination of probable temperature and wind, therefore, to be used for any particular exposure is the one that gives the lowest "effective temperature."

6. Architects should require manufacturers of new types of windows to submit their product to some properly-equipped institution for test. Such tests should be made on specimens that have been in service one year or more where practicable.

7. As a general rule, storm sashes are mechanically air tight, reducing the infiltration through the sash to a negligible amount. In such cases the total infiltration for the room should be checked against minimum ventilation requirements and heat provided to heat the required amount (if any) of fresh air.

Where storm sashes are loose-fitting, a certain amount of air infiltration takes place. There are three effects to be considered in this case:

a. Closing of the sash against the window frame.
b. Air pressure created in the space between the storm sash and window sash.
c. Infiltration through window into room caused by above air under pressure.

The combined effect of all these items operates to convert much of the velocity head into a static pressure head and resistance loss, resulting in a very low infiltration. In the absence of exact data, it may be assumed, safely, that even loosely-fitting storm sashes cut the infiltration loss in half.

8. In estimating infiltration for steel sash, only the perimeter of the ventilating (movable) sections or panels should be considered. After determining the width of crevice when the movable sections are in closed position, the infiltration for the most severe probable wind for the exposure in question should be used. The sides, top and bottom of the window frames, where same are set against masonry, and also the mullion bars, where one frame is set against another, should be of air-tight construction, and should not be included in infiltration computations.

Some Thoughts on the Combustion of Oil Fuel

(Continued from Page 64)

HOW HEAT IS TRANSFERRED WHEN BURNING OIL

Then we have to consider the heat transferred to the "indirect" surfaces of the boiler by the hot gases of combustion which pass along them on their way to the chimney. It is desirable that the hot gases rub or "scrub," as the term is, the boiler surfaces, transferring heat to them by "convection." A thorough knowledge of the laws and phenomena of the flow of gases is necessary for proper boiler design, as two boilers may have exactly the same number of square feet of secondary surface and be otherwise identical, yet one may absorb much more heat than the other, and if turbulence can be induced without involving objectionable resistance, higher heat-transfer can be expected.

If a volume of gas is flowing past a surface in such a way that the pressure of the gas increases, heat will be transferred to the surface more rapidly than if the line of flow of the gas were slightly away from the surface. Hot gas rising along a vertical surface will not transfer heat to it as rapidly as if the surface had been inclined slightly toward the flow of gas. Again, consider a round pipe carrying water, and having a flow of gas past it at right angles to its axis. Even at low velocities, the circular shape of the pipe will cause a vacuum to be formed below the pipe and eddies above it. Of course with increased gas velocity, even more of the surface becomes ineffective. If the pipe were "streamline" in section, following aviation practice, the gas would scrub along practically every portion of its surface. At the present time, such shaped pipes may not appear practicable, but it must be remembered that only a few years ago airplane struts were circular, and only the demand for higher efficiency produced the streamline sections.

A following article will deal with the modern conception of the combustion of hydrocarbon fuels.

The Sale of Gas for Heating

Experiences Which Show the Importance of Securing the Co-operation and Support of the Heating Contractor

By Glenn C. Carnahan

The Peoples Gas Light and Coke Company, Chicago

(From a paper on "Factors and Influences that Promote the Sales of Gas for Heating," presented at the convention of the Illinois Gas Association, in Springfield, Ill., March 17-18, 1927.)

IN SELLING gas for heating, apparently there are three main problems to be solved. First, in acquainting the public with the fact that manufactured gas is being used for home heating; second, to establish the fact that the cost of heating a home with manufactured gas is as low as it is, and third, to stimulate each slightly interested customer to a point where he will make the outlay of money for the necessary equipment and conclude to pay the increase in heating cost of gas over his present fuel. At least two boiler manufacturers are helping gas companies establish manufactured gas as a home heating fuel in the minds of the public. Our company has advertised consistently in local newspapers for over three years. In spite of this, it seems that the attention of the majority of our prospects must be secured by personal canvass. We are making progress, but it must be admitted that gas has just begun to secure public attention as a home heating fuel.

HEATING homes with gas in Chicago has been actively promoted since October, 1923. As a result of 3½ years of active campaigning, 1600 Chicago homes were heated by gas during the winter of 1926 and 1927. It is realized that such a number is a very small percentage of the total possibilities and, as yet, no very definite conclusions can be drawn. However, certain definite facts regarding selling and servicing gas-fired central heating plants seem to be formulating.—GLENN C. CARNAHAN.

Perhaps the reason that the general idea of heating by gas does not register as strongly, through advertising, as might be anticipated, is because the general impression exists that the cost of home heating with manufactured gas is prohibitive. The most effective advertising by our company concentrated on the subject of cost. Advertisements showing the detailed cost per season of common types of homes, brought the most productive class of inquiries. This class of publicity has been effectively supplemented by billboards and by pamphlets in which the predominating theme is operating costs. Slowly, but surely, the erroneous prevalent opinion regarding the cost of gas heating is being corrected.

Securing contracts for the necessary equipment and subsequent sales of gas only can be accomplished with an adequate sales force. Personal canvass is now, and will be for some time to come, the keynote of a sales campaign. That the sales force must be especially trained in the knowledge of gas and in heating practices generally, is an established fact. We have found that one or two years are required to round out the usefulness of our heating salesmen, chiefly because it takes about that long for them to acquire a working knowledge of general heating practices. The day has not yet arrived when our customers are deciding to heat with gas without first having contact with a competent field salesman, although a few exceptions are beginning to occur.

One of the most important parts of a salesman's knowledge is ability to estimate accurately the rate of heat loss from a building. This estimate is the basis of sizing the appliance and estimating the cost of the season's fuel. Reasonable variations may be compensated for in radiation and boiler sizes, but to be inaccurate in the estimated cost per season either increases the sales resistance unnecessarily by having the estimated cost too high, or eventually results in a dissatisfied customer by placing the estimate lower than the actual cost.

INFLUENCE OF THE ARCHITECT AND HEATING CONTRACTOR

The measure of success to be attained in selling gas for house heating will depend largely on the support secured through the architect and heating contractor. Selling resistance to gas heating is decidedly less in new homes than old. If the gas-fired central heating plant is installed at the time the building is erected, little extra expense is necessary in order to use gas, and it is only necessary for the salesman to convince the owner and his architect that gas is desirable.

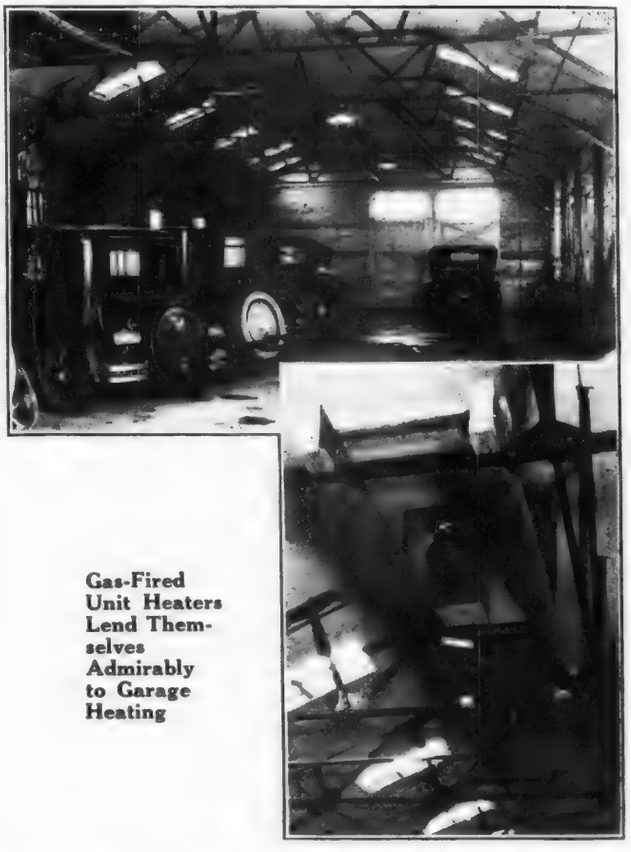
The heating contractor who installs the plant has a very decided influence in the owner's final decision, and it is necessary, therefore, that they be furnished the facts, as well as the owner and architect.

Decided progress has been made with both architects and heating contractors in Chicago. Sev-

eral architects are now recommending gas heating to their clients and specifying it in certain classes of homes where they feel it is most suitable. This is being done, in some cases, without solicitation on our part, and has resulted from the contact these architects have had with previous gas installations that have been highly satisfactory to their clients.

Heating contractors have shown an unusual response to gas heating. Thirteen heating contractors are either displaying gas-fired equipment, or using gas heat in their place of business. Eight more are heating their homes with gas. The United Association of Journeymen Plumbers and Steam Fitters of the United States and Canada use a gas-fired central heating plant in their headquarters. This installation has given gas heating an unusual amount of publicity with the heating fraternity.

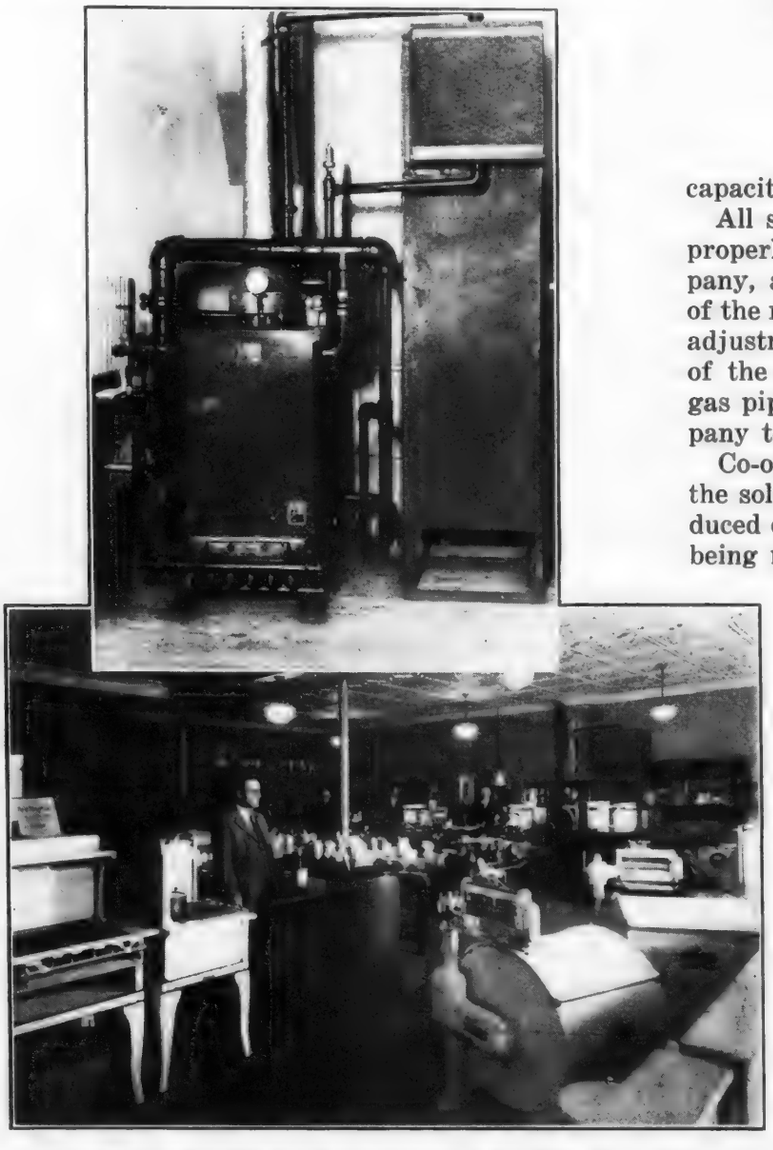
It is felt that the splendid progress made with the heating contractors in Chicago has resulted from our early policy of co-operating with them. All of our installations have been made by them. On installations in new homes we have acted in the capacity of a jobber in supplying the gas boilers.



Gas-Fired Unit Heaters Lend Themselves Admirably to Garage Heating

All servicing of gas-fired equipment, after once properly installed, has been handled by our company, and heating contractors have been relieved of the responsibility and expense of any subsequent adjustments. Personal instruction on the erection of the boilers and the proper connections of the gas piping is supplied free of charge by our company to the fitters actually doing the work.

Co-operation with the heating contractors and the solicitation of the architects already have produced encouraging results—50% of our 1926 sales being made through these channels.



One of The Peoples Gas Light and Coke Company's Stores Equipped with a Gas-Fired Boiler Supplying Steam to a Unit Heater, Shown Above

INFLUENCE OF SPECIAL GAS RATES FOR HEATING

A special heating rate seems to be desirable, if not almost essential in the selling of gas to home owners. Most prospects feel that this relatively large use of gas entitles them to some price concession. Most every one is accustomed to wholesale rates being applied to quantity purchases, and it is only logical that many prospects feel they are buying gas in wholesale quantities when they begin heating their homes with it.

IMPORTANCE OF SELECTING AND DEVELOPING SUITABLE EQUIPMENT

Permanent and continued progress in the sale of gas for heating can be definitely

assured only if the proper equipment is used. It would seem that the gas-fired heating appliances offered to-day are fairly well developed, and the necessary controls, which are more important from the standpoint of the satisfaction to be secured by the customer than the thermal efficiency of the appliance, are in such stage of development that their continued satisfactory performance is assured.

Fortunately the room-temperature control had been developed and perfected in connection with coal-burning appliances before gas heating got under way. In the last three years water temperature and steam pressure controls for gas boilers have been improved, and the low water fuel cut-off, the water feed, and the safety pilot control have all been developed in the face of urgent necessity. At the present time, the gas-fired central heating systems that are being sold and installed are equipped with all the accessories necessary for the highest grade of service.

Our experience has led to more careful consideration being given to flue connections and chimneys. The material used in the vent connection between the boiler outlet and the chimney is of better quality than heretofore. Russia iron flue pipe no longer is tolerated. Galvanized flue pipe also has been found to be unsuitable. During the last year, we have used either Terne-plate or Ascoloy. These are the only two materials we have found suitable. Flue pipe is now cemented to the inside of the chimney at the liner, as well as at the outside wall. When a chimney is encountered, that is in a bad state of repair, a liner of the same material used for the vent pipe is extended inside the chimney to the top above the roof.

Chimneys that are affected with down draft, due to their relative height in relation to the high point of the roof or to an adjacent building, must be extended or equipped with a chimney top that will prevent down draft. Adequate draft is absolutely essential and the down-draft diverter at the boiler is to be depended upon only to equalize the draft in the boiler, and as a safeguard against an occasional blocked chimney, but never should be considered an adequate cure for a consistent down draft.

NEW DEVELOPMENTS IN THE ART OF HEATING THAT HELP GAS SALES

Vacuum system and vapor heating specialties have done much to remove the objection to the intermittent firing of gas boilers by keeping heat in steam radiation long after the fire has been turned off in the boiler, as well as obviating the necessity of expelling air from the radiation at the beginning of each firing period. Quick-venting valves on the radiators and returns are absolutely essential in a steam system operating with a gas-fired boiler.

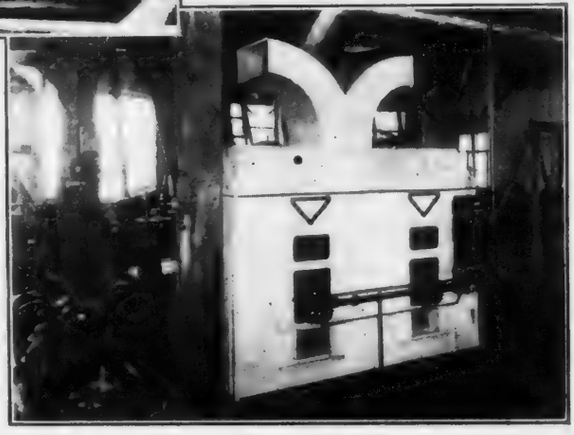
Pressure or closed water radiation systems are desirable with gas-fired systems, as intermittent heating seems to require more frequent filling if an open expansion tank is employed. Shortages in radiation can be compensated for by converting an open water system to a pressure system by reason of the fact that water radiation, when under pressure, can be heated to steam temperatures without danger.

Unit heaters open up the factory and garage heating field in more satisfactory manner than heretofore from a gas standpoint. Unit heaters also make it possible to use gas steam boilers in heating stores without basements and without using boiler pits or overhead water systems, both of which had their objectionable features in this class of heating.

Concealed radiation, while not affecting gas heating directly, is a new development and should be thoroughly familiar to gas heating salesmen. If artificial cooling of homes is to be linked with heating, it seems quite probable that this form of radiation may play an important part.

Insulation is among the recent developments in better building construction. Among recent developments, this one seems to hold more promise as a real stimulant toward more gas heated homes than any. Of all the heat losses that occur from the ordinary home, only the heat carried away by air

A Gas Direct-Fired Fan-Driven Unit Heats This Factory



changes is absolutely essential. The other losses, while not entirely preventable, are not necessary. It also may be said that in many cases the air change is far in excess of the necessary amount for healthful living conditions.

Recent experiments and tests have established beyond a doubt that where proper consideration and provision are made at time buildings are erected, heating cost easily may be reduced 50% over those experienced with ordinary construction. These same improvements can be applied to homes already built, but not as completely as is possible in new construction. Savings amounting to between 10 and 20% have been effected where insulation and storm sash or weather strip have been applied.

It behooves the gas man who is selling his product for heating homes to be thoroughly familiar with these various materials that will reduce unnecessary heat losses, and to preach the doctrine of better construction in home building. Proper construction makes it possible for owners to heat their homes as cheaply with gas at prevailing prices, as it would have cost with less expensive fuels generally used in homes of ordinary construction. Such a program removes the most prevalent objection to gas heating in new buildings, which is the increased operating cost over other commonly used fuels. The cost of heat-proofing a house is probably only 5% to 10% of the total cost.

SERVICE TO HEATING CUSTOMERS

This department of an organization selling gas for heating homes must be equally efficient as the one whose business it is to sell the idea and the necessary appliances. Continuous satisfactory service should be experienced by every customer, and, to make this a reality, there must be a prompt response to every request for service, whether or not the cause is trivial or urgent.

Customer's service consists of two distinct divisions—first is mechanical service required on the heating system. This involves not only the actual gas boiler or furnace itself, but all other portions of the entire heating system. We have found it necessary to provide our service men with a working knowledge of all the heating accessories that are in use, as the failure of any part of a heating system is generally referred to the gas company when the customer begins using gas as a fuel.

It has been our practice to provide one annual cleaning and inspection. At this time the gas heating appliance is thoroughly overhauled. Any new parts required, such as flue pipe, are renewed at this time. This work is generally done during the summer months, which helps to keep the service men busy during this period, and also obviates the necessity of shutting off the heating plant during the heating season. We are now beginning to get some idea of the extent of mechanical service required on gas-fired central heating systems. During the year 1926 the average number of service calls for all reasons averaged 5 per heating customer. This figure included the annual inspection, and the turning on of about 50% of the plants in the fall, and turning off a like amount in the spring. This leaves an average of about 3 calls per season per plant for all other reasons, which includes the adjustment and the first inspection on all new installations. It also includes the calls made by the service men to instruct heating contractors on the erection and installation of the appliances. First-year installations require more servicing than those in operation more than a year, due to the first adjustments and the necessity of instructing the owners in the various phases of the plant operation. The figures indicate that the old installations require an average of about one service call per year in addition to the annual inspection.

Our maximum day on servicing in 1926 was 75 calls. This occurred during the last of September, at the beginning of the first cold spell. The calls were largely to put new installations in operation and to increase the water temperatures and steam pressures on other new installations.

The other kind of service required from heating customers (especially first year users) is in reassuring them regarding the amount of their first few bills, and in checking against the season's estimate to see that the current bills are in proper proportion to the severity of the weather during the time covered by each bill. A comprehensive method is indispensable in discussing heating bills with customers, or comparing the bills for the same period during successive seasons, as well as in arriving at the approximate savings effected by various improvements in the home, such as, storm windows, insulation, or weather stripping. Unless such comparisons take into consideration the exact temperatures they are of little value, and may be misleading.

By reason of the fact that we consider such a method of comparison indispensable in our business, the method and its derivation is given here in detail with the hope that others may find it useful.

Electric Heating of Circulating Water in Britain

INSTALLATIONS, in which the water for heating large buildings is warmed electrically during off-peak hours, are now in operation in England. A system of thermal storage is provided to maintain the water at the required temperature during the day. As the result of the success of one installation in the plant of an English electrical concern, the company is installing a similar system in another building now under construction.

The electrical load in these two installations is 800 K.W. and 1800 K.W., respectively. In both cases, the electrode system of heating is employed, and the high-pressure supply is used without resorting to transformers.

The Mechanical Ventilation of the St. Louis Schools

AN ENGINEERING STUDY

By Edwin S. Hallett
Chief Engineer, St. Louis Board of Education

Part VI

MANY school officials and school building architects have decided that there are two sides to the ventilation question and they would prefer to go slow and let the interested parties settle the matter. This is a very improper and ruinous position to assume. It is this aloofness that is at the bottom of the whole situation. A serious inquiry by men of scientific training from these most interested groups would bring such enlightment as would stop this unrest and waste of time and resources.

THE ORIGIN OF CRITICISMS OF VENTILATION

The foremost cause of complaint of mechanical ventilation is that it is not operated. This condition is due to the fact that the plant has sufficient direct radiation in the rooms to permit heating them in nearly all weather, and the janitor or operating engineer will not take the trouble to run the fan if unnecessary. If he be commanded to operate it against his will, he can easily make the occupants wish he had not, by creating drafts and dust. This has often been done. Heating and ventilating engineers have no occasion to be put on the defensive for such situations. There are persons who yet drink from any country spring or brook and insist that they get away with it, but that does not convince thinking people that city water purification is not a necessity in our day.

The defects and shortcomings of many ventilating plants are not arguments against mechanical ventilation. It must be remembered that nearly all the scientific knowledge of heating and ventilation is less than ten years old and the old stuff is not worthy of defense. If 55% of the mechanical plants are not being operated, that is a 55% failure on the part of the designing engineer in laying out a system that can be so abused. The element of design is more important and vital than the quality of performance that it may be expected to produce. Comparisons made from such installations are worthless. They are deceptive.

Imperfect operation may be caused by the complicated and scattered layout of the plant. There is a limit to the capacity of every engineer or custodian and the vexation of climbing over long lines of pipes and ducts wears the most faithful employee. Nothing has ever been done of greater value than the design of a compact self-contained and simplified ventilating system, and while such compact design is a boon to the operating engineer it is of even greater consequence to the architect and owner in the economy of room and apparatus cost. Then it transpires that after these two important advantages have been accomplished, a better control is produced by the use of automatic devices and, finally, planned means of supervision by instruments placed at a central desk.

THE OLD BUGBEAR OF DRAFTS

Excessive air motion, called drafts, have long been considered by many as inherent defects of fan ventilation. The sensation of air motion in a school room is just as much to be desired as the excess is abhorred. Mechanical ventilation is controlled ventilation if it is anything. If the plant does not so function it is unworthy the name. Where fans operate at a constant speed, as they should in cold weather, and the heating coils are controlled by thermostats, the volume dampers should and can be set to introduce an amount of air into each room that will be pleasing to all. When the fan speed is changed it upsets all damper settings and will generally give trouble in cold weather. Cold air in motion is always disagreeable to persons sitting quietly. Such conditions are indefensible by any engineer. They are not necessary and do not occur in plants with trained operators.

The writer went further to make all plants foolproof in the design of a diffuser that would so introduce the air into the classroom that a draft would be impossible with the maximum air supply provided in any fan system. This is a scientifically-designed apparatus that put an end to all apprehension or fear of too much air motion.

PREJUDICE A FACTOR

Heating and ventilating engineers must recognize that their work, the output of their building design, must meet the approval and disapproval of persons in good health and in poor health, of vigorous athletes and sedentary anaemics, of conscientious students and indifferent time servers. Not many will have the scientific background to appreciate the progress in this new field of research. Therefore, the training of the operating employee must be in a far more difficult science than that of running a fan ventilating plant. He must have a constant training in a special school for such employees, that shall deal as much with the human reactions as with the physical characteristics of the plant. No kind of open-window

(*Continued on Page* 79)

A Gas-Fired Unit and Fan-and-Duct System

Unique Installation Proposed by Los Angeles Competitor as Solution of School Ventilation Problem

AMONG the solutions submitted in the contest on school ventilation, conducted recently in THE HEATING AND VENTILATING MAGAZINE, one of the most interesting and unusual was that proposed by Everett S. Buck, of Los Angeles, Calif., involving a combination of unit and fan-and-duct systems, gas fired.

In the first place, Mr. Buck proposes to introduce the air into the class-rooms through nozzles at a velocity of 800 F. P. M.; he states that velocities up to 1000 F. P. M. have been used without noise. These nozzles are located near the ceiling, while exhaust grilles with volume dampers are placed near the floor.

The fan selected has a capacity of 10,000 C. F. M., when unassisted by the units, and has 18,000 C. F. M. capacity when all units are aiding it; the fan is turbine-driven and all exhaust steam from the turbine and auxiliaries is used for doing useful work. The air quantity required was taken as 1500 C. F. M. per room, as this volume will sweep clear across the room without excessive air motion at any point, states Mr. Buck.

When the room temperature reaches 68° F., the Mercoid control is arranged to break the unit fan circuit and cut off the gas so that the air then supplied will be at the normal main fan temperature of 56° F., plus a small amount of residual heat from the unit. Under such conditions the velocity will be lowered but still will be sufficient to sweep across the room.

As soon as the room temperature drops to 68° F., the unit again starts up and at first the air will feel cool and refreshing and gradually will become warmer until it is above the room temperature. It is obvious, continues Mr. Buck, that this intermittence may be varied at will by varying the flow of gas to the unit. In summer the gas would be cut off altogether and the control arranged to give an increased air flow when the room temperature increased, instead of diminished.

Boiled down to a few words, the scheme utilizes a steam boiler which is coal-fired, a steam turbine-driven fan for about 60% of the required ventilation, gas-fired units, with automatic control, to supply the balance of the ventilation, and exhaust steam for heating hot water for service use, such as showers and lavatories.

As shown in Fig. 1, which is the first-floor plan, there is a recirculation duct placed under the first floor and all exhaust outlets from the first floor are connected into this duct. For the second floor, as shown in Fig. 2, vertical flues are run up from the lower story for the supply, and the vent flues from the second story are carried down to the recirculation duct under the first floor.

Mr. Buck's reply to Question 20 in the questionnaire is as follows:

"The first and essential thing to strive for in any heating system is comfort. We have heard teachers praise a comfortable heating system even while they were being poisoned by its noxious fumes, and while it is a question which cannot definitely be settled in the light of present knowledge, I am inclined to believe that the value of the comfort factor is so great that it actually overbalances *minor* gas poisoning. The effects of minor gas poisoning can be observed in lessened haemo-

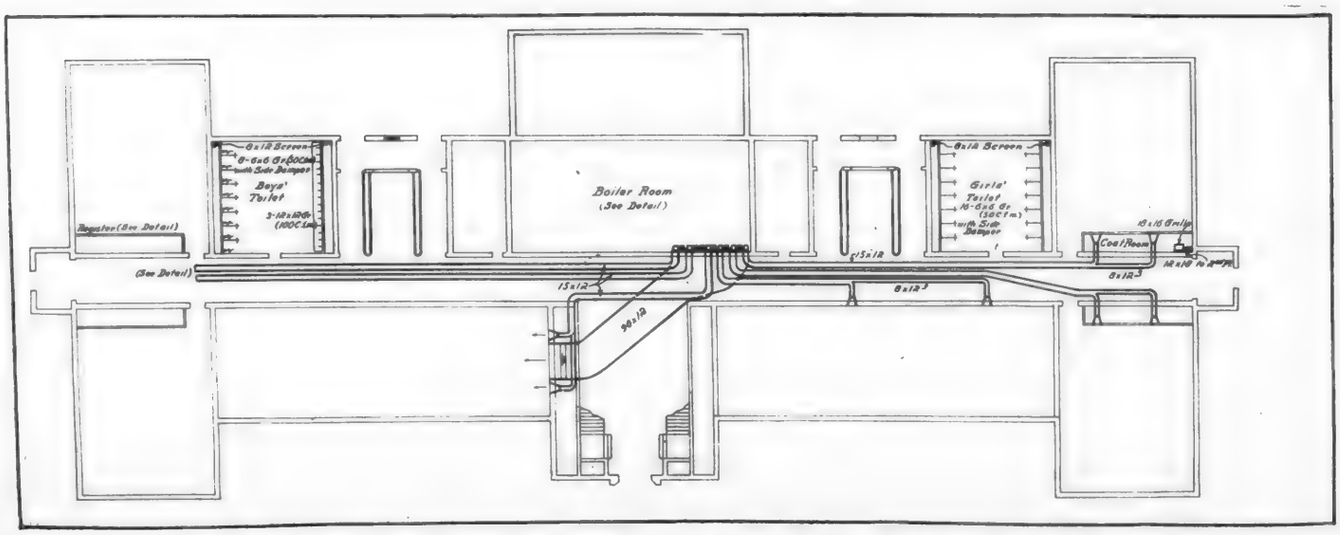


Fig. 1. First-Floor Plan of School Equipped with Gas-Fired Unit and Fan-and-Duct System

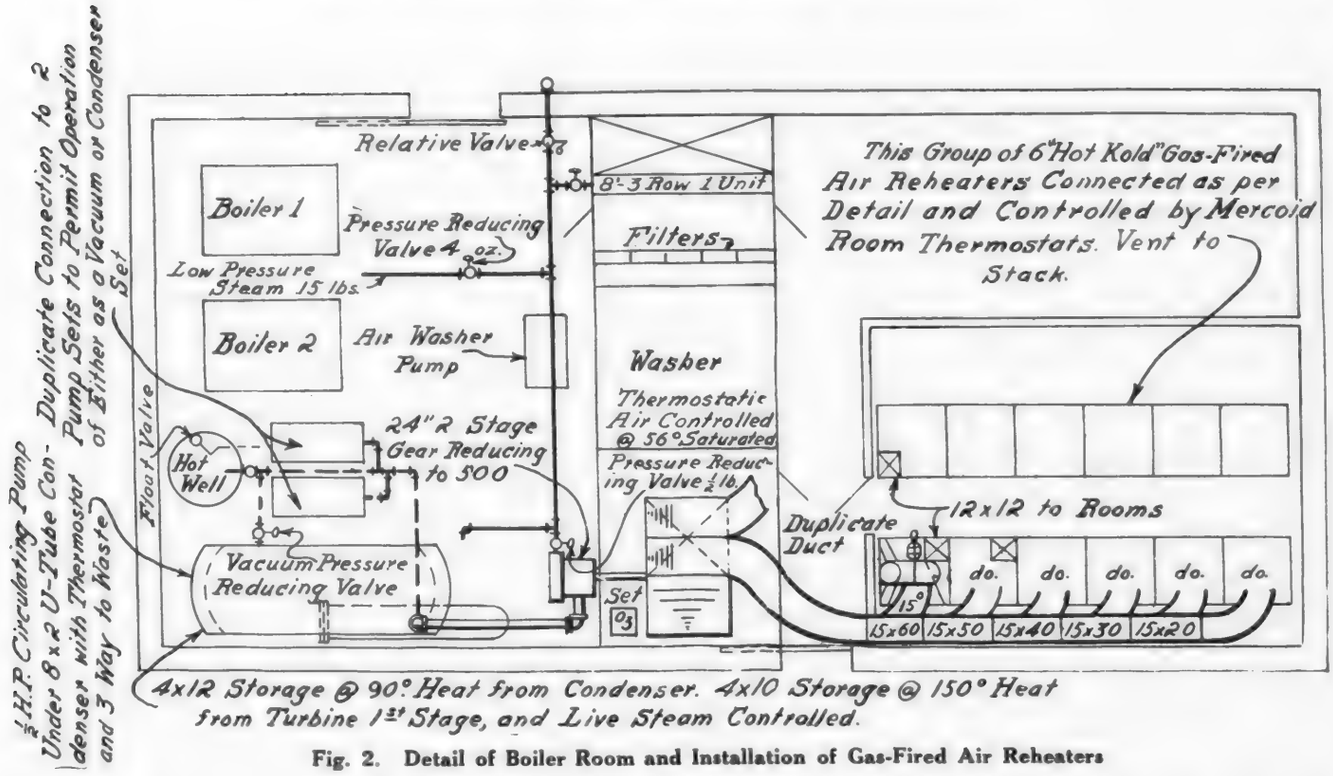

Relative Valve
Boiler 1
Pressure Reducing Valve 4 oz.
Low Pressure Steam 15 lbs.
Boiler 2
Air Washer Pump
8'-3 Row 1 Unit
Filters
This Group of 6" Hot Kold" Gas-Fired Air Reheaters Connected as per Detail and Controlled by Mercoid Room Thermostats. Vent to Stack.
Washer
Thermostatic Air Controlled @ 56° Saturated
Pressure Reducing Valve ½ lb.
24" 2 Stage Gear Reducing to 500
Hot Well
Float Valve
Vacuum Pressure Reducing Valve
Set
12x12 to Rooms
Duplicate Duct
do.
15x60
15x50
15x40
15x30
15x20
4x12 Storage @ 90° Heat from Condenser. 4x10 Storage @ 150° Heat from Turbine 1st Stage, and Live Steam Controlled.
½ H.P. Circulating Pump Under 8 x 2 U-Tube Condenser with Thermostat and 3 Way to Waste
Duplicate Connection to 2 Pump Sets to Permit Operation of Either as a Vacuum or Condenser Set

Fig. 2. Detail of Boiler Room and Installation of Gas-Fired Air Reheaters

globin, but we have no set standards of increased health tone directly due to comfortable temperature surroundings.

"But we must go further than merely "warm enough" for the ideal system. Every one is familiar with the mental and physical exhilaration induced by the fitful breezes of a perfect spring day. We are aware, too, that these playful breezes do not affect the thermometer reading, but by increasing surface evaporation of the body, there is a decided effect on the heat output, with consequent reaction on the human system.

"All the requirements of a perfect June day are met automatically by this system, which is a combination of proven fool-proof units. The only unit that every practicing engineer has not used by this time and proven to his entire satisfaction, is the 'Hot Kold', which is simply an automatic gas furnace with a silent-type fan mounted on it.

"I approve of it because one naturally favors his own offspring, and because the leading engineers of the southwest have unanimously given it the rating of the 'highest efficiency ever developed by any central heating system.' (Three tests actually averaged over 95% of the high heat of the gas.)

"However, these are not yet obtainable in commercial quantities, so any unit gas furnace of 50,-

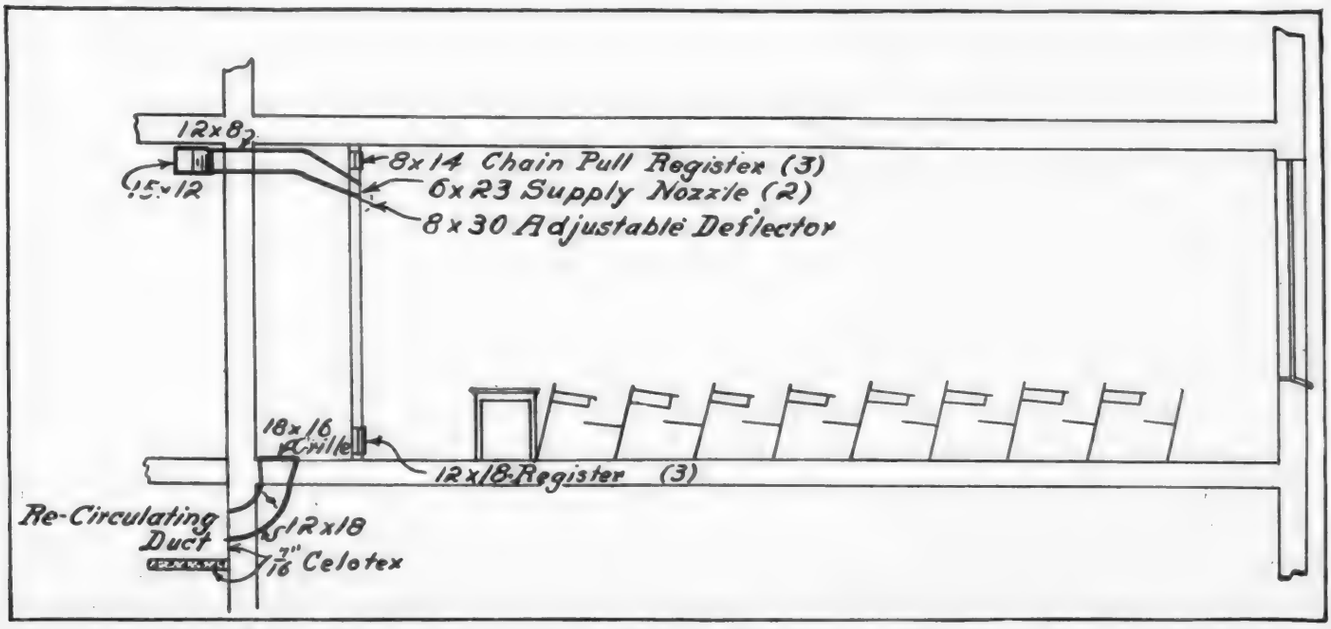


Fig. 3. Arrangement of Typical Air Inlet, Deflector and Recirculating Duct for Classroom

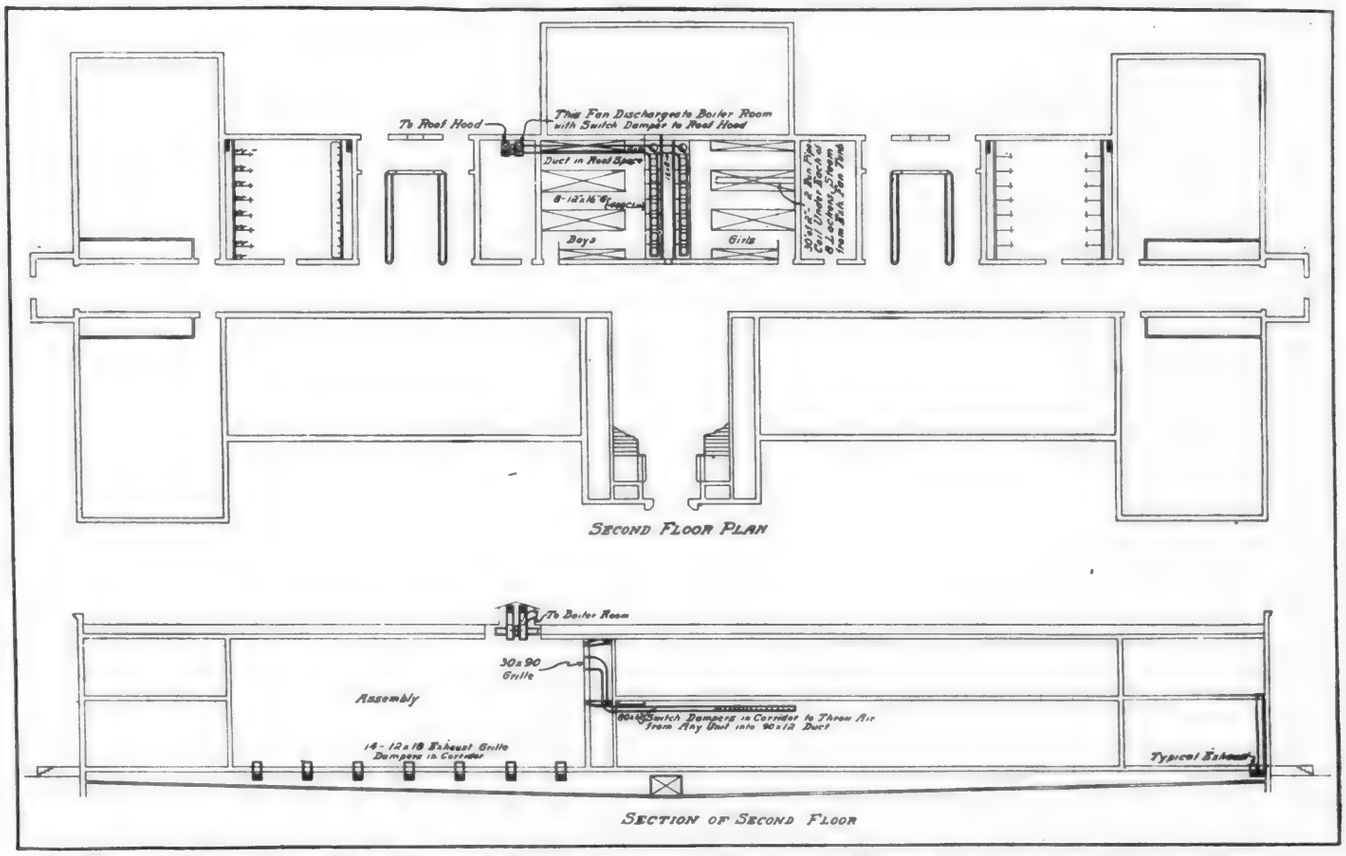

To Roof Hood
This Fan Discharges to Boiler Room with Switch Damper to Roof Hood
Duct in Roof Space
Boys
Girls
SECOND FLOOR PLAN
To Boiler Room
30x90 Grille
Assembly
Switch Dampers in Corridor to Throw Air from Any Unit into 90x12 Duct
14 - 12x18 Exhaust Grille Dampers in Corridor
Typical Exhaust
SECTION OF SECOND FLOOR

Fig. 4. Second-Floor Plan, Showing Switch Dampers in Corridor to Throw Air From Any Unit Into Duct

000 B.T.U. capacity, and any fan which you know is utterly silent, will fill the bill. This fan and a solenoid gas valve are thrown directly across the line by the American Radiator Company's double-pole Mercoid stat.

"Even if the school were not in the congested district, I would insist on the shower facilities shown. Any physical teacher will assure you that exercises must be carried to the perspiration point if they are to be really valuable. Why send these sweating little bodies back to pollute the air we are so carefully treating? A quick shower, a rub-down, back into dry clothing, and you have a child who is fit, clean and refreshed. You are building bodies which simply are bound to resist disease.

"Inspection and calculation will show that by use of the equipment outlined, and an operating schedule to fit in with the physical instructor's time, all the exhaust steam can be used (for heating in the winter), and by operating condensing in the fall and summer, the shower water heating will take it all. Some live steam will have to be bled for heating in the winter and still more if the showers are used freely. This is done automatically, as shown.

"The use of similar units of combined boiler-feed and vacuum pumps, one as a hot well and air-removal pump, and the other as a condenser pump, permits duplicating the connection so that one may always function as an emergency condensate return.

"Of course, the system could be driven solely by electric motors, but low-pressure turbines are cheap, and will handle accidental or necessary overloads and will pay for themselves many times in power saving. It is becoming increasingly evident that the engineer must earn his fee by showing economy of operation, or be lost in the mad rush of low-grade draftsmen and 'heating experts.'

"Do not imagine it would take a 'flock of trained arrows' to get the air movement described. One of

(*Continued on Page* 79)

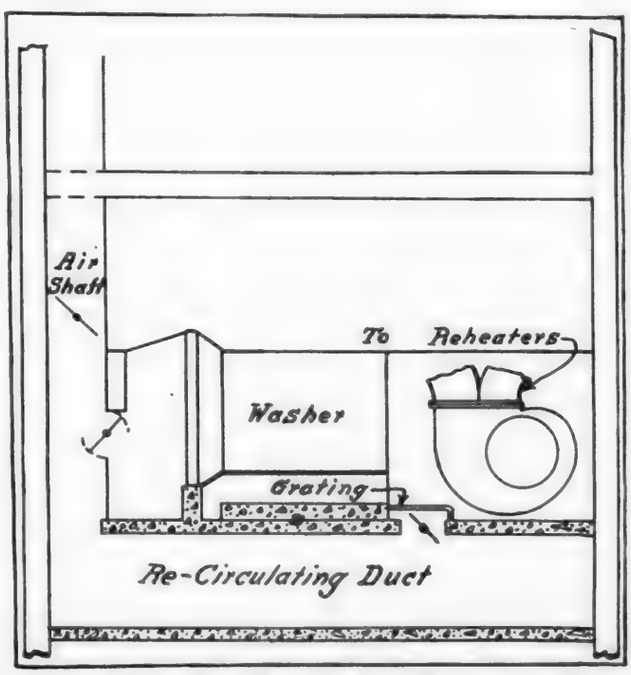


Fig. 5. Detail of Fan and Washer Unit and Recirculating Duct

This is the twenty-fourth lesson of The Heating and Ventilating Magazine's

New Home-Study Course in Gravity Steam and Water Heating

Lesson No. 24—Steam and Water Boilers*

By Ara Marcus Daniels

STEAM boilers are of two kinds, (a) power boilers, (b) heating boilers. Power boilers are built for generating steam for operating power units, such as engines, pumps, and the like. Heating boilers are built for generating steam to supply the piping and radiators of heating systems. Water boilers are built for two purposes, (a) to heat water for circulation through the pipes and radiators of a heating system, designed to maintain a desired temperature within a given structure, (b) to heat water for delivery to hot water faucets or fixtures for domestic, laundry, or similar uses.

Boilers are many and varied in design. Essentially a steam boiler consists of three parts: (1) a firebox or furnace in which the fuel is burned, (2) a boiler proper or vessel in which the water is boiled, (3) a space above the water in which the steam generated therefrom may be stored, before delivery into the distribution system.

Each of the three parts of a steam boiler has a distinct function to perform, and in a properly-designed and operated boiler, the functions of the different parts are harmonized and co-ordinated.

The furnace or firebox should be so designed as to promote as nearly perfect combustion of the fuel as possible, in order that all the heat contained in the fuel may be liberated.

The boiler proper should have ample capacity to hold the required quantity of water and should have the heating surfaces which absorb the heat from the fire and conduct it to the water so distributed with reference thereto, and so designed with regard to areas in contact with the fire and gases of combustion, as to assure a maximum extraction of heat therefrom before the gases pass into the smoke flue.

The steam space should be amply large and its horizontal area, with reference to the water surface area, should be such as to assure prompt separation of the steam from the water, in order that the steam may be delivered into the distributing system as dry as possible.

Work Problem B-1-1

*Copyright, 1927, Ara Marcus Daniels.

PRINCIPLES OF OPERATION

When heat developed in the furnace is applied to the boiler, immediately there is a movement of water established. The layers of water in contact with the heating surfaces, becoming higher in temperature, expand, become lighter in weight per unit volume, and hence, rise to make room for the colder and heavier water. This rise in temperature

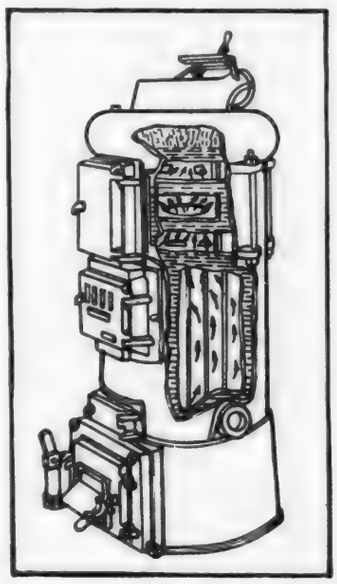


Fig. B-1-1. Design of Round Cast-Iron Boiler

continues, increasing in rapidity as more heat is added to the water.

When all of the water in the boiler is heated to a temperature approximately equivalent to the respective boiling point, small globules of steam form on or adjacent to the inner surface of the boiler in contact with the fire. These small particles of steam, being many times lighter in weight than the water, seek to rise rapidly to the water surface. If they are hindered in their upward movement, or if this tendency to free themselves from the water is interfered with, the combined volume of water and globules increases rapidly, with the result that the surface of the water in the boiler rises and what is known as priming occurs. Therefore, it is essential that all water passages in the boiler be amply large to permit or, better still, to

assure free upward movement and positive and quick release of these steam globules from the water at its surface.

Work Problem B-1-2, B-1-3

With such release of steam from the water surface, the steam space above the water soon fills and, as boiling continues and more steam is delivered into this space, the steam becomes denser, with the result that a pressure is gradually built up in the boiler. Steam, then, may be delivered into the distributing system, and, if the boiler is capable of evaporating water at a rate equal to or greater than the rate at which the radiation on the system condenses the steam therein, then continuous operation may be maintained by burning fuel at such a rate as will supply the required amount of heat.

Work Problem B-1-4

CLASSIFICATION

Heating boilers properly are classified under two main heads according to the material of which they are built, namely, (1) cast iron, and (2) steel.

Work Problem B-1-5

The cast-iron boiler is found in three distinct types: (a) round boiler, (b) sectional boiler, (c) smokeless or down-draft boiler. The steel boiler appears in two distinct types, (a) the portable, (b) the brickset, both of which are built for direct-draft or down-draft (smokeless) operation. The

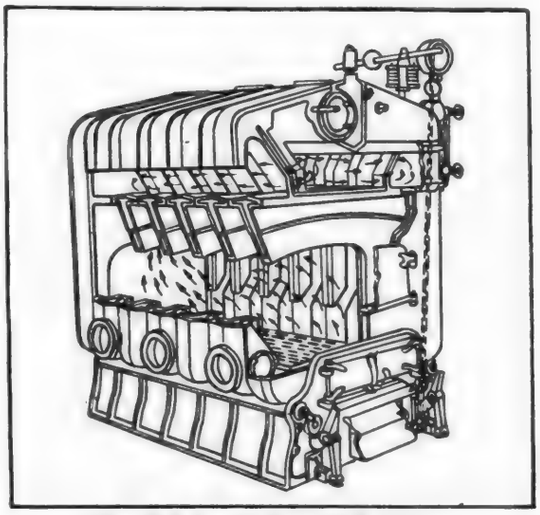


Fig. B-1-2. Design of Sectional Cast-Iron Boiler

portable steel boiler is built as a vertical and as a horizontal boiler, the horizontal appearing as the return-tubular type, the firebox type, and the internally-fired or marine type. The brickset boiler is built as the firebox type and the horizontal return-tubular type.

Work Problem B-1-6

CAST-IRON BOILERS

In Fig. B-1-1 is shown a round cast-iron boiler. This type of boiler is the most common type used for heating residences and small buildings. It consists of several castings placed horizontally one on top of the other. Those sections, which are hollow and filled with water, are assembled with push or screw nipples and long bolts to pull and hold the sections together. Push nipples are accurately machine-turned and provide a water-tight metal-to-metal joint. The grate area for a round boiler, of course, is fixed, while the heating surface for a given diameter may be varied within certain

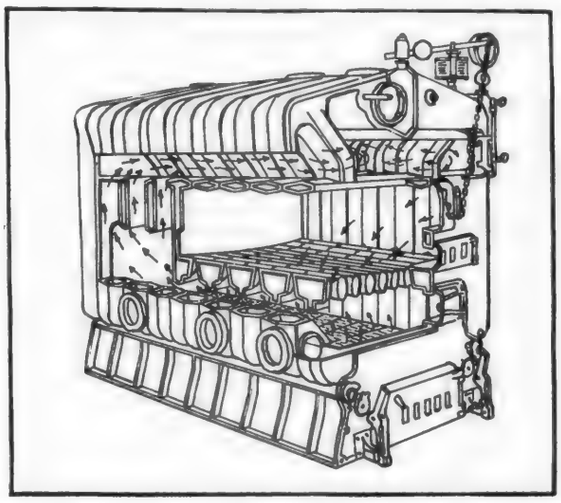


Fig. B-1-3. Design of Sectional Cast-Iron Down-Draft or Smokeless Boiler

limits, depending upon the number and size of the heating sections used in the assembly.

In Fig. B-1-2 is shown a sectional cast-iron boiler. This type of boiler may consist of from five to ten or more sections, joined with nipples. In the larger sizes, the sections are made in two parts to facilitate transportation and erection.

Work Problem B-1-7

In Fig. B-1-3 is shown a sectional down-draft boiler. This type of boiler is built primarily for burning soft coals without smoke, hence the name "smokeless," which is often given a boiler of this kind. Such a boiler has special furnace construction. The furnace includes two grates, instead of one, as found in the ordinary boiler. These grates are placed one above the other. The upper grate is called a water grate since the grate-bars are made hollow and the water in the boiler circulates through the casting, thus preventing damage to the grate.

The fuel is fed onto the upper grate only. Air instead of all passing upward through the fuel bed, as in the ordinary type, enters at the top and passes downward through the fuel-bed. Combustion is most active at the bottom of the fuel-bed. The volatile gas in the fuel, being freed on the top of the bed, passes down through incandescent fuel where it is ignited.

On the lower grate there exist, practically continuously, small pieces of coke which have fallen through the upper grate and, being constantly replenished from above, present always a glowing

bed of fuel. Thus the space between the two bars is maintained as an exceedingly hot combustion chamber, and presents a most suitable condition under which the descending volatile gas from the fuel bed above may mingle with hot air, which enters through the lower grate, and thus promote a high degree of combustion efficiency and assure practically smokeless combustion.

In general, it should be observed that exceptionally good draft and excellent chimney and flue construction are required for the smokeless type of boiler if best results are to be secured. Each manufacturer usually specifies the minimum allowable heights and areas or diameters of chimneys required or insisted upon.

(*To be Continued*)

A Gas-Fired Unit and Fan-and-Duct System

(Continued from Page 76)

our local engineers has made many of these high-velocity nozzle installations, and they are the answer to all your diffusion and air-movement difficulties. The registers shown at the ceiling would be opened full for summer, and nearly closed in winter.

"In case of gas failure the steam heater is adequate for heating with hand control. If electricity fails, the main fan will carry it, also under hand control. If the main turbine goes out, the gas furnace's little fans will keep it warm. If either boiler fails, the other is adequate.

"The fuel selected should be based on a careful study of local costs and the janitor attention available. Have automatic gas operation for night heating, by all means. The use of temperature-controlled valves can be extended to make the system entirely automatic in all its phases, if desired.

"If, in advancing such designs as this, you are met with arguments that the system is complicated, your answer must be that any portion of it may be valved off and continue to function, with less economy, true, but without the slightest danger or interruption as long as heat is supplied at the boiler.

"The duct system is self-explanatory, and we will let the editor explain why his boiler room is on the ground floor."*

EVERETT S. BUCK.

*The boiler-room space was indicated on the first-floor plan by the architect, but the floor level could be lowered, if necessary, to accommodate the design.—EDITOR.

The Mechanical Ventilation of the St. Louis Schools

(Continued from Page 73)

or fan ventilation will satisfy all the teachers, nor will the combination of these or any other kinds accomplish the impossible. The plain duty of the custodian is to maintain air conditions that are approved and known to be the best for the children and have the utmost patience with the exceptional teacher who is suffering from some illness of mind or body.

The outbreak in writing books on ventilation by persons who could have no information on the subject and which serve only to confuse those who want the truth, calls for a deliberate statement of facts which have had indisputable verification in actual schools.

Most persons know only the meaning of the word "recirculation," as defined in the dictionary. It is not a subterfuge to produce economy of fuel at the expense of the quality of the schoolroom air. It is an improved means of securing better ventilation, independent of the cost. It is a process of continuous repurification and results in a constant high degree of purity and cleanliness of the air not attainable by any other means.

The illustration of the purification of the swimming pool water is a point in hand. The writer's method of constant recirculation of the pool water through filters and ozone maintains a purity of water 100 times better than the allowable limits for drinking water of the city mains. This is far superior to emptying and refilling the pool every day. It does save expenses but it would be just as much justified if it cost more. The same is true of the purification of the air by a continuous process of passing through the washers, filters and ozone purifiers.

The oxygen is not reduced to a measurable degree. The odors are all removed; the whole volume of air is removed and renewed at less than one-hour periods. Such air is much lower in bacteria count than the outdoor air and contains none of the sulphur gases that poison plants and animals in the city outdoors. Recirculation, of course, must be accompanied by the repurifying equipment of ventilation as now designed.

Much is heard of the vital qualities of air, and when such persons are questioned as to their meaning they can not give an intelligible answer. The vital quality of air is oxygen; this is so well known that the children of the grades recognize its uses. Oxygen can be made to be more active in its operation than the natural substance usually is by quickly liberating it from some combination, as in the use of chlorine for sterilizing and bleaching. Oxygen is best treated for this activating process by subjecting oxygen to the violet rays of the sun or from the electric source and we call this active oxygen by a new name,—ozone.

At to any mysterious vital quality that natural air may have, there is no such thing. There are no air vitamines. There is nothing that can be removed or injured by its passage through a fan or ducts. To assert such a belief is to revert to the merest hocus pocus and quackery.

In his concluding paper, Mr. Hallett will discuss the value of trained operators for handling mechanical ventilating equipment and will give details of the methods so successfully followed in the St. Louis school for custodians.

PIPECRAFT

PART IV

Hot Water Runouts

Hot water systems are essentially different from steam systems in as much as they employ a heating medium (water) which constantly fills the entire system and slowly circulates when heat is applied at the proper point. With steam systems the heating medium (steam) only *fills the system* when supplied in sufficient quantity to exceed the condensing capacity of the system.

Consequently, while the chief points to be remembered in steam systems is to take care of condensation and to provide for the rapid expulsion of air where steam is supplied to such systems, the chief factors to be kept in mind in hot water heating are the proper grading of pipes, to promote the circulation all that is possible, and the arrangement of the pipes so that no air pockets will be formed where the air is caught and cannot escape.

Although it has been stated that hot water systems employ a heating medium which constantly fills the system, this does not mean that the piping and radiators can be installed full of water in the first place; on the contrary, these systems—just as steam systems—are erected a la Volstead; that is to say, absolutely dry—and must be filled with water before operation is commenced. Consequently the piping must be arranged so as to allow the water to enter every part of the system immediately, dispelling and replacing the air in the pipes and radiators; and where this is absolutely impossible to

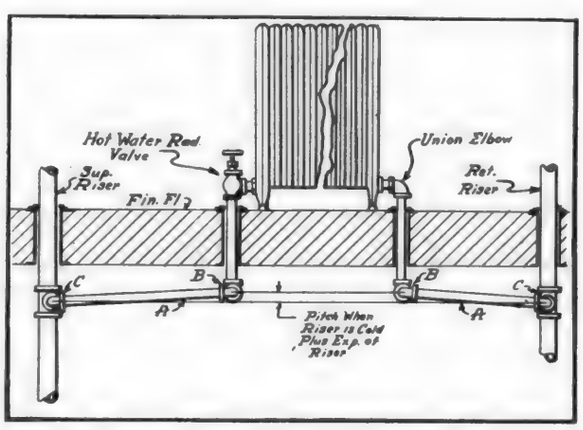


Fig. 27. Typical Connections for Up-Feed Gravity Hot Water Radiator

arrange, air valves must be placed to relieve the entrapped air, such as in the tops of bottom-feed radiators.

Having arranged the piping to permit the filling up of the system satisfactorily, the matter of grading should next be considered. As a general principle in gravity hot water systems, the supply main and branches are graded up *continuously* from the hot water boiler to the radiator connection, while the return also pitches up continuously from the boiler to the return connection on the radiator. This results in all the supply water, flowing out in the supply line, gradually rising upward continuously and uninterruptedly until it reaches the radiator; the return water, flowing in the reverse direction, will have a continuous and constant downward progress from the radiator return connection to the boiler return connection. This arrangement is almost invariably used with the up-feed gravity hot-water system.

In such systems the air—in filling up—is pocketed in the tops of the radiators and must be relieved

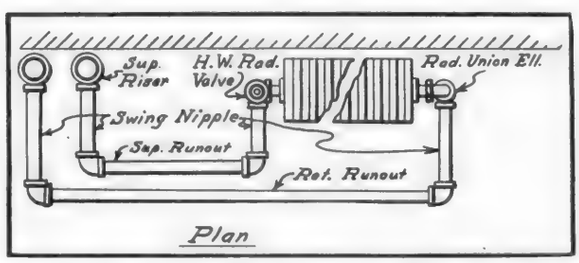


Fig. 28. Arrangement of Connections When Hot Water Supply and Return Risers are on Opposite Sides of Radiator

by air valves on the radiators. Moveover, a certain amount of air will separate from the water as the system continues in use, being driven out of the water by the process of heating and natural separation. This air accumulates in each high point and will gradually build up and increase as time goes on until it interferes with the circulation. Beginning with a single bubble it enlarges until it may fill the entire pipe.

With the up-feed gravity hot-water system pitched as previously described and using bottom-feed radiators, the high points all come in the tops of the radiators, and unless hot-water air relief valves are placed on such radiators satisfactory operation will never be attained.

Providing for Expansion in Hot Water Runouts

The riser expansion for any gravity hot-water system is usually taken at 75% of the amount occurring in a steam pipe of equal length. Expressed in another way, this is about ¾ in. per 100 ft. Therefore expansion of the hot-water risers takes place practically along the same lines as already described for the steam risers but it is only ¾ as much.

Swing nipples in the radiator runouts are just as essential in hot-water work as in steam, and typical connections for the ordinary up-feed gravity hot-water radiator are shown in Fig. 27. The expansion arm "A" swings on the two swing nipples "B" and "C" and should have allowance made in the pitch for any upward movement of the riser in the same manner as described under the steam systems.

Where the hot-water supply and return risers are on opposite sides of the radiator the connections are re-arranged as illustrated in Fig. 28. If the runouts are to be located above the floor, greater difficulty is experienced in providing for vertical movement in the riser, owing to the necessity of maintaining appearance and the lesser space conditions in which to work. Typical connections for the ordinary case are shown in Fig. 29, where the length of the runout is sufficient to take up a small amount of riser movement by spring alone, but suitable allowance must also be made by additional pitch of the runout for any upward riser movement which may occur.

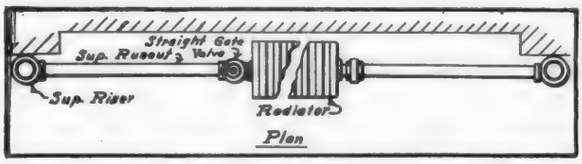


Fig. 29. Typical Connections Where Length of Runout Takes Care of Riser Movement

Tight Connections

In tight cases difficult situations sometimes are found which almost make it impossible to provide for riser movement without marring the appearance of the job. Fig. 30 illustrates a case where the riser is far enough out from the wall to permit coming out of the riser on the opposite side and running around in back of it, then breaking forward enough to meet the line of radiator inlet.

Where the riser is too tight against the wall to permit this little manoeuvre, the same idea may be used except modifying it by coming out of the front and then offsetting back with two 45 deg. elbows.

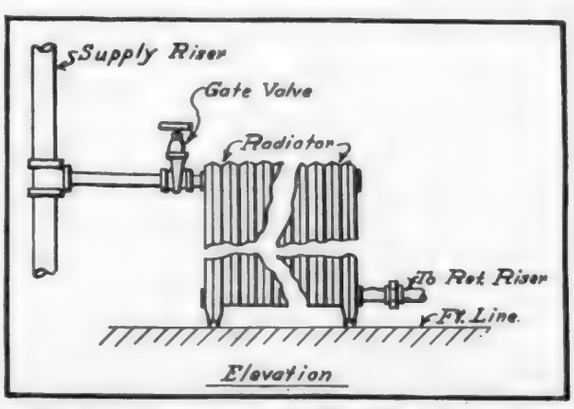


Fig. 31. Connections on Down-Feed System for Short Drops

Air Ventilating in Downfeed Hot Water Systems

Automatic air venting of hot water radiators through the piping can be secured only with a down-feed hot water system. In such systems a top connection is used to the supply end of the radiator and this connection is pitched down toward the radiator. Owing to the fact that air will always rise to the highest point, the air accumulating in the radiator works out through the top connection, and this automatically relieves the radiator. The air then rises up to the top of the drop where provision for its relief must be made.

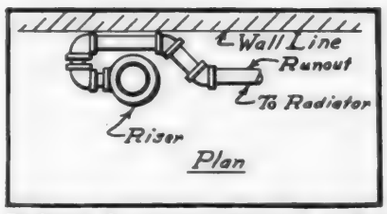


Fig. 30. Radiator Connection Running in Back of Riser

For short drops, connections on the down-feed system can be made as shown in Fig. 31, but where the drop has considerable expansion movement to be taken care of, a more flexible branch must be used. Besides the ideas illustrated in Fig. 30, or the alternate of coming out of the front of the riser, there is also the scheme of coming out of the riser above the level of the radiator tapping and then breaking down to the radiator connection, as illustrated in Fig. 32.

The advantage gained by this idea is the additional length of pipe secured in the runout as well as the extra joints, all of which act to gain greater flexibility. A globe valve may also be used in this case but it should be placed so as to close *against* the flow and not against the radiator.

The next installment will be devoted to pipe sleeves, pipe covering, double runouts, and valving and draining risers.

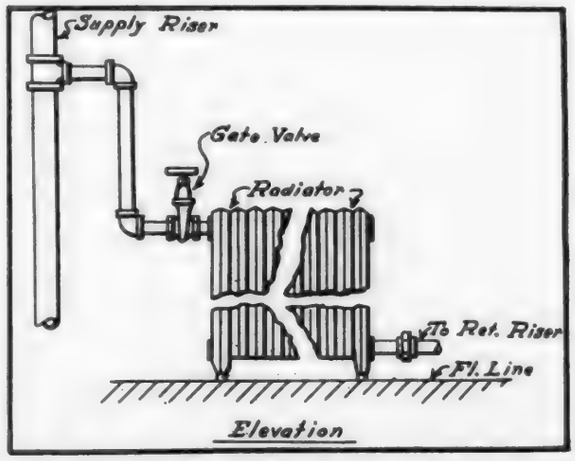


Fig. 32. Alternate Connections on Down-Feed Systems

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THERE is significance in the statement that the warm-air furnace industry, after long preparation through research, is preparing to "cash in" on its achievements. For several years now we have been hearing of the more or less dry data developed in the research laboratory of the University of Illinois and at the Research Residence in Urbana. There has been no lack of skepticism, both in the warm-air furnace industry and out of it, as to the value of the work, and it has taken considerable vision and determination to carry it through. It must be a source of no little satisfaction to be able to say, as did President Langenberg, in his annual address before the National Warm-Air Heating and Ventilating Association, the other day, that all of the objectives originally sought in the association's plans have been achieved, including the connection with the University of Illinois Research Laboratory, the drafting of a furnace installation code, the construction of the Research Residence, and the development of a rating formula for warm-air furnaces.

That these objectives have been part of a comprehensive plan is borne out in the statement that the association's work has now reached a point where the industry should commence to realize on its investment of time and money in the project. An intensive and sustained sales effort is indicated "to secure the universal adoption of warm-air heating in the home," a pretty big contract, to be sure, but one not lacking in incentive.

It is worth noting, too, that pains have been taken to have in readiness, with a two years' period of training behind it, an Educational Publicity Department, which will be expected to function largely in the pending major sales effort.

IRRESPECTIVE of its success or failure, the method followed by the warm-air furnace interests basically is sound and may well serve to point the way to older and more experienced engineering or commercial bodies.

Is it not remarkable that of the different methods of heating, steam and hot water are the only ones that are not being brought regularly and consistently to the attention of the general public? To be sure, coal, gas and oil, each of which has its publicity bureau, are as applicable to steam and hot water as to air, but not more so in view of the recent important developments in the way of all-steel and welded warm-air furnace construction.

So the situation exists in which the story of anthracite is told regularly in *Anthracite Coal Service*, the story of oil fuel is the burden of the American Oil Burner Association's selling campaign, gas is championed in the American Gas Association's *Monthly*, and in its clip-sheet, *Gas Progress*, warm air heat is furthered by the National Warm-Air Heating and Ventilating Association, while steam and hot water are left to shift for themselves in popular estimation.

A TIMELY warning is sounded by the Bureau of Industrial Hygiene of the New York State Department of Labor in connection with the use of ozone in garages to nullify the effects of carbon monoxide. Ozone has its uses, but this is not one of them. It seems that the idea has been held rather widely that ozone is capable of changing carbon monoxide into carbon dioxide directly. A series of tests was conducted by C. M. Salls, of the bureau, the results of which are given on another page. Briefly, they disclose the fact that there appears to be no interaction between these two gases. In consequence, Mr. Salls urges the enforcement of the code rule (719) of the New York Labor Law which provides that "every workroom in which carbon dioxide is emitted or created in or in connection with any process of manufacture, shall be provided with such ventilation that the carbon dioxide shall not exceed one-half part in 10,000 volumes of air in any occupied part of such workroom."

American Oil Burner Association

Oil-Burner Industry Plans Huge Advertising Campaign

Association Will Spend $150,000 During Summer Months Selling Oil-Heating Idea. President Jacobs Re-elected

THE fourth annual convention of The American Oil Burner Association, held at the Statler Hotel, Buffalo, April 5-7, will go down in history as marking an epoch in the growth of this industry.

Under the executive direction of the youngest man yet to hold presidential office, the association has passed through a critical year and emerged, as exemplified at the convention, in all the strength of unity and concord. The modest announcement made by President Jacobs in his opening address that the past year has seen the membership increased by such organizations as the Williams Oil-O-Matic Heating Corporation, the American Nokol Company and the Winslow Boiler Engineering Company, left no doubt in the minds of his audience that the formative period in the association is now past.

Lionel L. Jacobs
Re-elected President of American Oil Burner Association

As a whole the convention was a great success, marred only by the fact that the exhibition, that has come to be a part of the convention, was held in the Broadway Auditorium, which was distant, as one of the members put it, "20c. by taxi from the Statler." This unfortunate situation caused no little grumbling, but will not occur in the future, according to Secretary Becker.

Nearly 800 members of the association registered, together with 1400 visitors, and over 400 attended the annual banquet.

When President Jacobs opened the first general meeting of the association, he addressed an audience of over a thousand persons, many of whom had come from far-distant states and from Canada. The wisdom of closing the exhibition hall while the principal meetings were in progress was evident, as at previous conventions the interest in the exhibits apparently overcame the desire to hear the speakers and, as a consequence, the scheduled meetings were poorly attended. Just the reverse was the case at this convention.

The program was exceptionally comprehensive, although the tendency seemed to be towards papers covering commercial or industrial phases, rather than technical matters of concern. Practically every announced paper was read by its author, and the list of speakers included many executives of the larger organizations who previously have not appeared before the conventions of the association.

With such a voluminous program, it is difficult to single out individual papers of special merit, inasmuch as different speakers covered many angles, but special mention must be made of the paper read by Frank Howard, president of the Standard Development Company, a subsidiary of the Standard Oil Company, and of the presentation of "Making Money in the Oil-Burner Industry," by Lawrence L. Smith, vice-president and general manager, Williams Oil-O-Matic Heating Corporation.

Mr. Howard added much cheer to the picture of the future domestic oil-burner industry by his optimistic view of the trend of events and his unqualified pronouncement that the American homeowner has nothing to fear in regard to the future oil supply. It is doubtful if any other individual in the country has a better opportunity to forecast future oil supplies, based on exact knowledge of conditions, and Mr. Howard's optimism came as a very happy aftermath to the recent scare initiated by the report of a Federal committee presaging oil fuel shortage.

The subject of the paper by Lawrence Smith is at the foundation of the oil-burner industry in all of its branches from manufacture to sales. Mr. Smith almost put a new face on the problem, and by the logic of his arguments and his personality so captured his audience that his talk was the subject of favorable comment on every hand.

The First Session—Tuesday, April 5

The morning of the opening day was devoted to registration, to a meeting of the Board of Directors, and to a meeting of members subscribing to the sales-stimulating campaign, in the Hotel Statler. At nine o'clock, the exhibit hall was opened in the Broadway Auditorium, where practically every exhibit was in place.

The general meeting of the association was opened in the afternoon in the ballroom of the Statler, by President Lionel L. Jacobs.

Mr. Jacobs, in reviewing the activities of the past year pointed out that, with the election to membership of the Williams Oil-O-Matic Corporation, the American Nokol Company, the Winslow Boiler and Engineering Company, and other prominent manufacturers, the association now included practically all of the manufacturers with national distribution. He spoke of the adoption of the new code of ethics, and hoped that this action would greatly stimulate the oil-burner sales wave and reduce sales resistance.

The address of Mr. Jacobs made it plain to his listeners that all had not been well within the industry; that many dealers and representatives had lost rather than made money; that the problem of service to customers has not yet been solved, and that only by standing shoulder to shoulder and working the solution out together could the various manufacturers expect to carry on to ultimate success.

Mr. Jacobs spoke briefly of the meeting held previous to the convention by a number of prominent executives, at which the matters of vital interest to the industry were discussed, and at which it was determined to sell the idea of oil heating to the American public. The plan, as developed, proposes the pooling of a sum that will aggregate between $150,000 and $200,000 to be raised by voluntary contribution of the members on a basis proportional to net sales.

This plan already has been accepted by a sufficient number of the member manufacturers to make its success assured; furthermore it is automatic in its continuance, being based on an advertising appropriation for each year, predicated upon the previous year's business. The result of the launching of this project means a tremendously strong and united appeal direct to the home owner. The details have largely been formulated and it will be put into operation at once.

Many other matters of mutual interest and importance were outlined by Mr. Jacobs, including the movement to secure uniform city ordinances, the relations of manufacturers to the Underwriters' Laboratories, the proposed reclassification of oil burners as Class 1 freight, which would impose a heavy burden on the oil-burner purchaser, who ultimately pays the bills, and the movement, in conjunction with Committee D-2 of the American Society for Testing Materials, for standardizing, as far as may be possible, domestic oil fuels.

Frank Howard, president, Standard Development Company, a subsidiary of the Standard Oil Company, then addressed the convention on the subject: "The Relation of Oil Fuel to Oil Heating." His talk was one of the high lights of the convention, and drew applause frequently as reference was made to the acceptance of the oil-burner industry by the oil interests as one of unquestioned importance. Mr. Howard told of the surveys made by his organization to determine the rapidity of growth and the stability in the burner industry, and his conclusions obviously pleased and heartened his hearers.

On the question of future oil supply Mr. Howard was clean-cut and emphatic. He declared that there was not the slightest cause for alarm on the part of the manufacturer or of the purchaser of an oil burner, as past experience in every field where oil or its products have been used indicates that oil can be supplied wherever a demand exists. New sources of oil are being found and new methods of producing oil fuels are more than keeping up with consumption; the future will simply be a balancing of demand and supply.

PRESIDENT HAMMERS OF NOKOL OUTLINES FOUNDATION OF OIL-BURNER INDUSTRY

Speaking on "The Industry's Merchandising Needs," Morgan J. Hammers, president of the American Nokol Company, stressed the desirability of unified, dignified, and honest sales efforts on the part of all manufacturers and their representatives. Comparing the growth of the oil-burner industry during the last ten years with that of the automobile industry during its similar initial period, Mr. Hammers said that the former had, on a financial basis, exceeded the latter by over 400%. This, he said, was sufficient evidence of the imporatnce of the oil-burner business to many overlapping interests.

Speaking of the banking world, as a group of prime importance to the oil-burner manufacturer and dealer, he said that the banker is apt to be prejudiced against the industry unless the slogan "no more loose sales talk" is strictly lived up to. He cited one case in particular where a Chicago banker had withheld financial assistance from a manufacturer because of rather eye-opening experience with salesmen of this and competing organizations.

As in every other phase of industry, manufacturers of oil burners and their distributors and agents require capital, and based on the growth of the last few years a great deal of capital will be required to properly finance this new activity. This financial foundation will be forthcoming, as Mr. Hammers pointed out, when the financiers are satisfied with the integrity of the manufacturers as a body, and with their methods of carrying on business.

M. H. Braden, vice-president, Nu-Way Corporation, spoke, as a manufacturer, on the relations that should exist between the dealers and the manufacturers they represent. He stressed the necessity for sound selling and financing on the part of the dealer, and for full harmony with the manufacturer in all matters of mutual interest. Particularly important is the training of the dealer to perform the technical parts of his obligation, pre-examination of each heating plant to see that it is in fit condition for a burner, installation and service. As a highly specialized field of endeavor, it is essential that the salesmen, as well as the installation men and sales force, understand the technical matters pertaining to burner functioning.

The opposite view of the problem was discussed by M. E. Simpson, Automatic Oil Burner Corporation, who stressed the fact that every manufacturer who extended all reasonable help and co-operation to his dealers thereby aided himself to the same degree. He discussed various methods of wholesale merchandising, and said that the best results would come where dealers were not required to carry stocks of burners above current needs, as where overstocked, dealers were apt to attempt to unload by selling burners for prices so low that no profit was made, which inevitably ended in disaster.

Mr. Simpson, who has had a wide experience in oil-burner merchandising, from the standpoint of the manufacturer as well as of the retailer, was emphatic on the point that no dealer should be required to "stock up" with burners, but, under a definite arrangement with the manufacturer should be supplied only at the rate at which he could make sales. In the former case Mr. Simpson claimed that the dealer would be required to put up $250 for every $100 invested by the manufacturer—an unfair arrangement. He closed his talk with an enthusiastic pronouncement of the solidarity of the oil-burner industry, based on the tremendous market, the growing public confidence, and the increasing tendency of the manufacturers to unite on all questions of mutual welfare.

The meeting then adjourned.

SECRETARY BECKER PRESENTS REPORT

A meeting limited to members of the association was held immediately following the adjournment of the general assembly, the focal point of which was the presentation of the annual report by Leod D. Becker, executive secretary.

Mr. Becker briefly outlined the activities of the association, disclosing a tremendous amount of pioneer work carried out with inadequate staff. He mentioned the mass of detail connected with the consummation of the annual convention; told of the formation and functioning of an employment bureau; of the liberal expenditure of time and money by high executives in the indus-

try who were lending themselves to the activities of the association.

The meeting at French Lick Springs, held prior to the convention, was outlined, and the members were told that a voluntary subscription, based on sales of each member company, would aggregate $150,000 to $200,000, which was to be used in a nation-wide campaign to sell the idea of oil heating to the American public. The decision to put on this campaign was reached on the basis of the effort of the past year, carried out with very limited funds, and only as a mail campaign.

Mr. Becker presented a round of recommendations as to future activities, which will be made possible through the increasing solidarity of the association. One of the most vital is the protest against increased freight rates, and the association is faced with an appeal to the Interstate Commerce Commission to prevent the proposed change in classification. Another matter of importance is the production and general use of uniform sales and service contracts, the standardization of free-service periods and the organization of dealer associations in localities where there are enough individuals at work to make such groups advantageous.

The initiation of the Institute of Oil-Burning Research, an organization subsidiary to the American Oil Burner Association, was announced, and its functions defined.

The secretary's report was unanimously and enthusiastically adopted, and the proposed increase in the number of directors was voted upon and passed. Then followed balloting for directors, with the results announced on page 88. The meeting then adjourned.

CONVENTION DISCUSSES UNITED ADVERTISING CAMPAIGN

A large crowd gathered in the ballroom for the evening session, which was devoted to "Advertising and Selling the Oil-Burner Idea." With President Jacobs in the chair, the meeting opened with a report by Leod D. Becker on the accomplishments of the past year in putting over the sales stimulating campaign. This program, developed by the William Green Corporation, is now on a five-year basis, with nine months of past activity restricted by inadequate funds. In spite of this handicap a great deal has been accomplished to acquaint the heating industry and the architectural profession with the salient points of oil heating. Nearly 7000 architects have been reached with a mail campaign consisting of a series of documents so prepared as to be filed in standard A. I. A. guides. This campaign has resulted in a flood of correspondence on the subject. In a like manner over 5000 heating contractors have been reached.

Mr. Becker touched upon the situation in the retail coal industry, where, as evidenced by newspaper clippings, there is considerable consternation as customer after customer turns to oil for fuel. The most discouraging phase of the situation is the fact that nearly all of these lost customers are those living in the best class of home and consequently the heaviest buyers of coal.

A great deal of valuable newspaper publicity has come from the announcement of the Institute of Oil-Burning Research, and the association will continue to derive much benefit from this channel.

J. J. O'Donnell, of the William Green Corporation, then outlined the plan for expending the funds raised by the association for the nation-wide campaign to sell the oil-burning idea. He presented charts showing potential markets, and graphs indicating the proposed campaign. He told of the interest that has been aroused in the heating and allied industries, and in particular in the architectural profession, citing the fact that over 2000 of the association handbooks had been sold to architects.

According to Mr. O'Donnell the following activities will be provided for: An appropriation of $8,000 for reaching the consumer, in addition to advertising in magazines; $6,000 for literature and contact with architects; $3,000 for builder contacts and $4,000 for reaching heating contractors and electric supply dealers. To bring the oil-burner dealers into strict conformity with the association's plans, $11,000 has been allowed; $2,000 for contact with oil fuel distributors and an appropriation to cover contact with coal dealers in an attempt to overcome adverse propaganda. Fire marshals and other city officials who are or may become factors in the sale or installation of oil burners will be reached in an attempt to promote uniform and effective local ordinances.

A comprehensive plan has been worked out whereby every oil-burner salesman in the country will be invited to join local organizations to be affiliated with the national association, so that the benefits accruing from its efforts and expenditures can be utilized by all.

ASSOCIATION MEMBERSHIP IS WORTH WHILE

How valuable is membership in the association and what the association can do for oil-burner manufacturers and dealers, was the theme of an enthusiastic address by Edwin M. Fleischmann, president of the May Oil Burner Corporation. Calling attention to the grief that has been prevalent in the industry in the past, largely as the result of loose sales talk, overselling and general individual selfishness, Mr. Fleischmann pleaded for universal membership and united and co-ordinated effort to sell the oil-burning idea. He said that many oil burners would sell themselves if given half a chance, and that many sales had been lost through overpresentation by the salesman.

Citing the rapid acceptance of the electric refrigeration idea during the last few months, Mr. Fleischmann said that it was solely the result of a united and dignified front adopted by the manufacturers in that field. He predicted a similar acceptance of the oil-burning idea and stated that membership in the association and hearty concurrence with its ideals was a prime investment for any manufacturer or dealer.

"OLLIE" WARD SAYS ASSOCIATION MEMBERSHIP PAYS

Oliver D. Ward, a young dealer of Rutland, Vermont, than whom there is no more popular dealer in the association, enthusiastically backed up the statements of Mr. Fleischmann. Selling burners in a community that probably would be sneered at by some of the high-pressure salesmen of the large cities, Mr. Ward has built up a fine business in which he feels that association membership is an important factor. He particularly brought out that the literature, prepared and distributed during the past year, had been of material help to him, and he urged that association membership be identified by the emblem and otherwise as a boost to dealers of recognized integrity and standing. Mr. Ward was outspoken in saying that the aim of the dealer, like that of the manufacturer, was to make money, and that only where a fair return rewarded honest and intelligent effort could the dealer, and the manufacturer he represented, succeed.

R. D. Marshall, Williams Oil-O-Matic Heating Corporation, then spoke, taking for his subject "Seize Your Opportunity." He pictured the present status of the oil-burner industry and compared it with the automotive industry at the same age and with the moving-picture industry. He stated that statistics indicated every bit as brilliant prospects in the oil-burner field as in the others mentioned, and said that it simply was a question of dealers awakening to the opportunity and then using the many helps toward success, of which the association was foremost.

The benefits of publicity were brought out in a brief talk by J. D. Barnhill of Lord, Thomas & Logan, Inc.

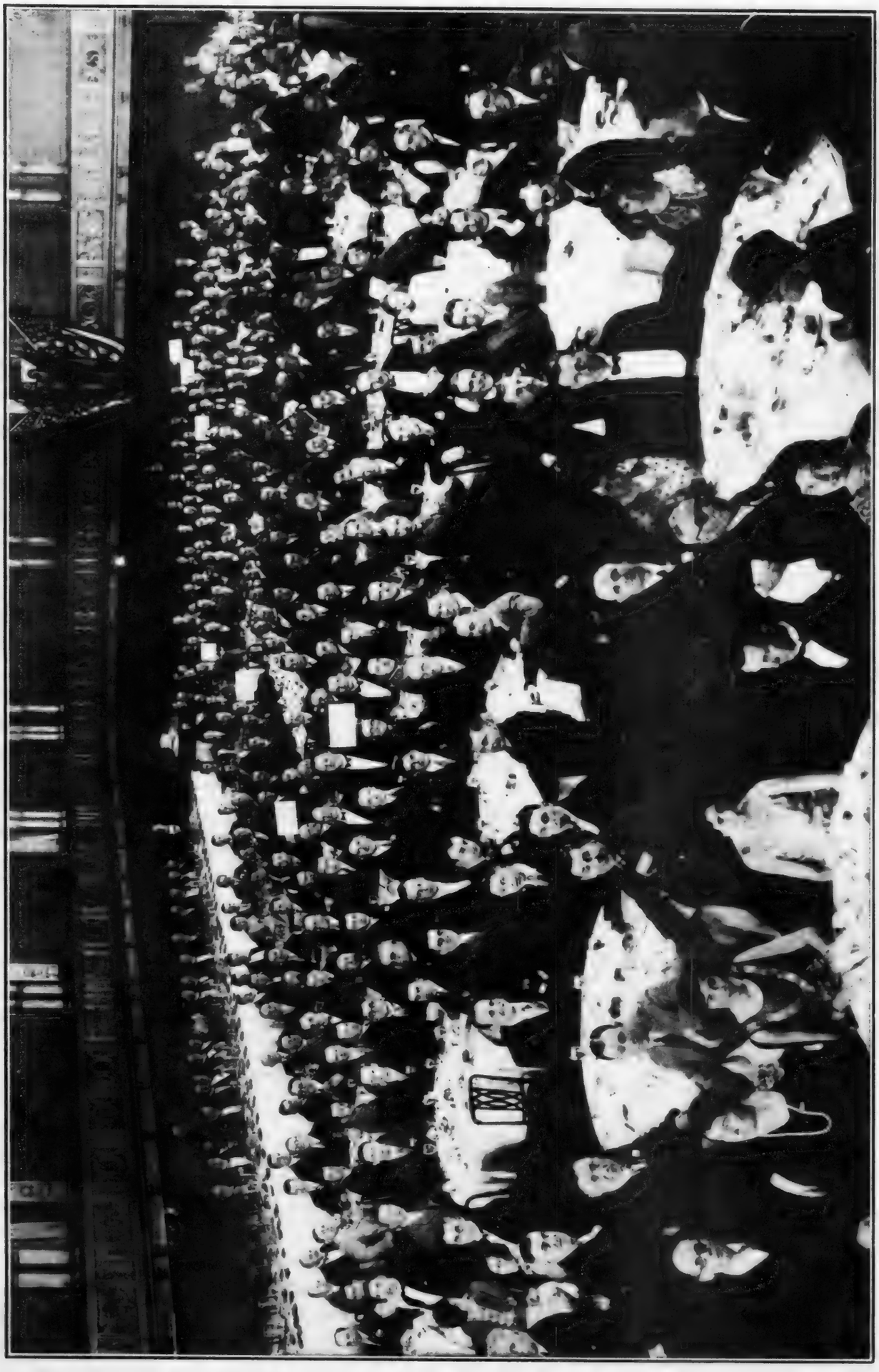
MAY OIL BURNER WORKERS SWEEP UP PRIZES

At the last convention it had been announced that a loving cup would be awarded to the manufacturer whose representatives brought in the largest number of new members to the association, and that prizes to individuals would be based on similar efforts.

Hearty applause greeted the announcement that the cup had been won by the May Oil Burner Corporation, and the presentation was accompanied by hearty congratulations from many of the losers. The May organization must have been out with blood in its eye, as the individual prizes were awarded to Wm. A. Webster and to Willard Karn, both representing "the Silent May."

LIONEL L. JACOBS RE-ELECTED PRESIDENT

A meeting of the new board of directors was held on Wednesday morning, resulting in the election of the of-



Annual Banquet of the American Oil Burner Association at the Hotel Statler, Buffalo, April 6, 1927

ficers named on page 88. The re-election of President Jacobs can be considered in no other way than a tribute to his administrative ability, diplomacy and personal character, as it was the universal feeling that his administration has brought about a unanimity in the industry that presages great progress in the future. In selecting E. P. Bailey as chairman of the board, the directors seized upon one of the most lovable personalities in the industry, whose quiet and self-effacing labors in the past have meant much to this young and rapidly growing association.

During the morning the exhibit hall was open, and, at the invitation of the American Radiator Company, many of the visitors boarded busses and inspected the Institute of Thermal Research. In the laboratory was much to interest the group; in particular, the evident importance paid to the oil-burner by this company, as indicated by the comprehensive tests that have been and are being carried out.

Afternoon Sessions—April 6

Two meetings were held simultaneously in the afternoon, one of special interest to the manufacturing group and the other devoted to dealer problems.

In the former the first paper with the title "Co-ordination of Research With Production," was read by James L. Breese, Jr. This was literally a presentation of the early problems of, and mistakes made by, the writer, and he very frankly disclosed his own errors in the hope that others might profit thereby. Mr. Breese pictured the development of a burner, through the laboratory stage and into the production period. He traced the natural tendencies of an engineer or inventor, and plainly indicated the difficulties that would arise from attempted production of the average burner as first designed and model-built. This was one of the most instructive papers of the meeting.

Franklin Hardinge, president of Hardinge Brothers, told of his experiences in developing the atomizer of the burner that bears his name and of the necessity for manufacturing many sizes in order that the highest efficiency be obtained for any load that might be met in practice.

The discussion that followed this paper indicated that many diverging ideas obtained as to the best way to prepare oil for combustion.

DEAN ANDERSON AN INVITED SPEAKER

The presence in Buffalo of Dean F. Paul Anderson led to an invitation to him to address the association, and as he had not been able to be present at the previous general meeting he was asked to appear at the manufacturers' session. Dean Anderson made one of his characteristic talks, telling the oil-burner manufacturers of the close contact that should be maintained between them and the heating industry. The Dean made a vigorous appeal to his hearers for closer working between the two groups and for an appreciation of the full value of the heating industry to the oil-burning group.

DEALERS DISCUSS SELLING PROBLEMS

In the meeting devoted to dealers and salesmen, held under the chairmanship of R. S. Bohn, F. H. Dickinson, president of the Dixol Service Company, led off with a discussion of "Why Sales and Service Men Fail." His talk was a vigorous arraignment of the common evils that have helped to retard logical development in oil burning. He pleaded for more thorough education of salesmen; for more methodical and painstaking covering of allotted territory; for more honest attention to the actual requirements of the potential customer, and for less loose sales talk. All of these deterrents to increased business can be overcome, he said, under a competent sales manager.

Homer R. Linn of the American Radiator Company was the next speaker, his talk being on the subject "How the Dealer Can Make Money." Mr. Linn disclosed, from the analysis of a comprehensive questionnaire, that about half of the dealers are not making money and that nearly all of the other half are not satisfied. His data showed that the majority of those making money were handling burners alone, while most of the failures were attempting to mix burner sales with plumbing and allied lines. He said that, on the other hand, where the merchandising of oil burners was made a department of an established heating business, with carefully handled and apportioned finances, it could become a most valuable adjunct to such an established business. Mr. Linn was emphatic in declaring that the sales of oil burners could not reach the ultimate unless carried on with a full appreciation of the fundamentals of the science of heating.

Lawrence L. Smith, vice-president and general manager, Williams Oil-O-Matic Heating Corporation, then spoke on "Making Money in the Oil Burner Industry." Mr. Smith presented much information secured from surveys in the oil-burner and other fields to substantiate his statements, and many of the figures proved distinct surprises to his hearers. He said that definite figures showed less than 4% of the purchasers of high-class burners as dissatisfied with them, and less than 1% not satisfied with the service rendered by local agencies. He maintained that such a condition called for sales in greatly increasing volume to take advantage of the boosting of enthusiastic owners. Speaking of the supply of oil fuel, Mr. Smith said that furnace oil is a natural product of the gasolene refinery, and that there would be no dearth of it as long as burners could be sold.

"Volume sales" was urged, while the American public has plenty of money for things that make life more worth living. This "luxury dollar" is becoming more and more plentiful, and it is only a question of whether it goes into automobiles, automatic refrigerators, radio or oil burners.

Mr. Smith also discussed the sales of nationally advertised products, and produced figures showing how much more readily such articles were sold in territories where the national magazines had the greatest circulation. Referring to the advisability of selling on the time-payment plan, he declared that three burners could be sold on that plan to one on the cash basis. He urged all dealers to be serious in their endeavors, and to use every means and assistance to carry on under full steam.

Wm. J. Foley, president, William J. Foley Company, oil-burner dealers of Denver, told, from a long and intensive experience, how the dealer should organize his business, and the fundamental principles he should adopt. He said that this business, as any other, requires business acumen, and that a technical knowledge of the product was also essential. He maintained that a dealer organization, qualifying in all of the vital requirements, could sell oil burners in every month of the year, and that such a business could return as great a profit as equal ability and endeavor could show in any other field.

The compilation of the manual of accounting for the oil-burner industry was then explained by Albert Aber, a professional accountant employed by the association to prepare this manual, this talk concluding the meeting.

BOARD OF DIRECTORS APPOINTS COMMITTEES

On Thursday morning the board of directors transacted important business, including the naming of the following to be chairmen of committees for the ensuing year:

General trade practice, Edwin M. Fleischmann; co-operation with underwriters' laboratories, L. H. VanNess; advertising councillors, Leod D. Becker; co-operation with heating industry, P. E. Fansler; membership committee, manufacturers' division, George P. Kittle; dealers' division, R. S. Bohn; finance & budgets, Walter F. Tant; constitutional committee, Edw. P. Bailey; research committee, James L. Breese; committee on uniform oil specifications, technologist to be appointed; committee on design & installation standards, W. M. C. Kimber; committee on uniform ordinances, B. F. Geyer; committee on patents, C. H. Chalmers; committee on electrical motor specifications, Karl B. Seegal.

As advertising councillors, the following were named: L. L. Jacobs, Leod D. Becker, C. U. Williams, E. M. Fleischmann, R. S. Bohn, Morgan J. Hammers and J. C. Johnson.

Meeting at the same time, the dealers' division elected the following board of governors, the first six to serve also as directors of the national associations:

New Officers and Directors of the A. O. B. A.

AN important association move was made when the board of directors adopted a resolution increasing its membership from 16 to 27 members, 6 of whom are elected from the dealer division. This means that the directorate will include 20 representatives of oil-burner manufacturers (Mr. Becker being a director representing neither class). The election held at this meeting fills the directorate, in almost every case, with the highest executives of the most important oil-burner manufacturing concerns in the country, so that the association is insured the hearty co-operation of an undivided industry. The directors now serve for three years, and in order to so constitute the board that nine members may be elected at each annual meeting, the entire directorate resigned and the following were elected for the period named. For one year: J. C. Johnson, president, S. T. Johnson Co., Oakland, Calif.; Geo. P. Kittle, president, Aeroil Burner Corp., Union City, N. J.; J. M. Nelson, vice-president, Sword & Kimber Co., Philadelphia; George Bullock, president, Caloroil Burner Corp., New York; W. M. Griffin, president, Wayne Co., Fort Wayne, Ind.; Franklin Hardinge, president, Hardinge Bros., Chicago, Ill.; W. B. Wilde, president, W. B. Wilde Co., Peoria, Ill.

For two years: E. M. Fleischmann, president, May Oil Burner Corp., Baltimore; Walter M. Tant, president, Silent Automatic Burner Corp., Detroit; Leod D. Becker, editor of *Fuel Oil*, New York; W. R. Ray, president, W. S. Ray Mfg. Co., San Francisco; H. Finnie, general manager, Timken-Detroit Co., Detroit; E. A. Weil, secretary-treasurer, Automatic Burner Corp., Chicago; W. A. Rosenfeld, president, The Nu-Way Corp., Rock Island, Ill.

For three years: J. S. Coonley, Jr., vice-president, Winslow B iler & Engineering Co., Chicago, Ill.; W. T. Koken, president, Electrol, Inc. of Missouri, St. Louis, Mo.; C. U. Williams, president, Williams Oil-O-Matic Heating Corp., Bloomington, Ill.; Morgan Hammers, president, American Nokol Co., Chicago; C. H. Chalmers, general manager, Chalmers Oil Burner Co., Minneapolis, Minn.; Lionel L. Jacobs, manager, Fess Oil Burners of Canada, Ltd., Toronto, Canada; Edward P. Bailey, president, National Airoil Burner Co., Philadelphia.

On Wednesday morning the new board of directors met and elected the following, to serve for the coming year:

President, Lionel L. Jacobs, manager, Fess Oil Burners of Canada, Ltd., Toronto; chairman of the board, Edward P. Bailey, president, National Airoil Burner Co., Philadelphia. Regional vice-presidents are: Atlantic, George P. Kittle, president, Aeroil Burner Company, Union City, N. J.; Midwest, Walter F. Tant, president, Silent Automatic Corp., Detroit; West, J. C. Johnson, president, S. T. Johnson Co., Oakland, Cal.; South, Edwin M. Fleischmann, president, May Oil Burner Corp., Baltimore; From the Dealer Division, Oliver Ward, W. W. Ward & Son, Rutland, Vt. Managing director, Leod D. Becker, American Oil Burner Association, New York.

Oliver D. Ward, chairman; N. E. Simpson, William J. Foley, W. Schwan, G. W. Neel, L. Straight, T. E. Parson, J. W. Scott, N. Jodchalk, H. Cook, Arthur Caveny, W. F. Schroederman and A. E. McInnes.

Afternoon Session—April 7

The last general session was under the auspices of the manufacturers' group, and was presided over by Walter F. Tant, president of the Silent Automatic Corporation.

How oil burners are sold by an organization only consisting of branch offices, was told by F. W. Hvoslef, chemical engineer of the Timken-Detroit Company. This talk brought out the essential differences between selling through agencies of the general type and through factory branches where all of the employees were under the direct and absolute control of the general sales manager.

B. K. Eaton, general manager of the Winslow Boiler and Engineering Company, discussed the organization of a manufacturer and of a dealer for service, and the concluding paper by Lewis Lipman, of the General Necessities Corporation, told how such allied necessities as oil burners and electric refrigerators logically and actually could be sold by a dealer. The session closed with a resolution acknowledging the services to the association and to the industry rendered by Secretary Becker.

SOCIAL EVENTS

A local association, hastily organized as the Niagara Frontier Oil-Burner Dealers' Association, undertook to provide the usual entertainment for visiting members and ladies, and it would indeed be mild to say that its efforts were up to previous standards. There are so many things to be co-ordinated at such at time that the task usually requires devoted service by many individuals for many months. In this case but seven weeks elapsed between the organization of the association and the convention, and the group deserves unstinted commendation for the smooth working out of its plans.

The ladies were taken to the Falls, to visit a nationally famous breakfast-food plant, to a special theatre matinee, and there were several bridge parties in the Statler. The first evening of the convention was marked by a dance in the ballroom for the visitors of both sexes, and a special meeting of the male guests was held in an adjacent room. On the last evening one of the popular night clubs was closed to the public and opened to all registered association members. Altogether the special features were highly enjoyed.

THE ASSOCIATION BANQUET

On Wednesday evening the annual banquet was held in the ballroom, attended by 400 members and guests. At its conclusion the association emblem was presented to Lionel L. Jacobs, the retiring president—E. P. Bailey making the presentation. Mr. Jacobs responded with a few words of appreciation. The speaker of the evening, Ernest H. Peabody, president of the Peabody Engineering Corporation, devoted the greater part of his address to personal reminiscences of his early experience in the marine oil-burning field. The banquet was livened by cheers and songs from various groups, the May crowd celebrating the winning of the membership loving cup. The entire attendance led by the orchestra, joined in songs, and the banquet was followed by a number of special offerings by local theatrical entertainers, after which there was dancing.

The directors will meet in July to determine the location for the next convention.

National Trade Extension Bureau, Evansville, Ind., announces a series of talks for the benefit of heating and plumbing contractors who have opportunities for addressing civic and other organizations on the subject of heating and sanitation. One of the subjects is "A Condensed History of House Heating." These talks require from 10 to 35 minutes to read. The bureau has also prepared 40 news items of interest regarding the value of heating and plumbing which it supplies without charge.

National Fire Protection Association, whose annual meeting is scheduled for May 8-12, at the Congress Hotel, Chicago, has issued new editions of some of its standard regulations. One of these is devoted to the construction and installation of tanks—both gravity and pressure—and towers. This pamphlet supersedes the edition of 1919. The text prepared by the N.F.P.A. Committee on Tanks, and adopted at the 1926 annual meeting, has been completely rewritten and a new section has been included on tank heating.

Exhibits at the Convention

THE exhibits of oil burners and oil-burner accessories and equipment that have become an integral part of the annual convention were housed in the Broadway Auditorium, an armory-like structure, located, as one delegate put it, "20c. worth by taxi" from the Statler Hotel. About half of the floor space of the auditorium was arranged in a conventional manner with uniform booths and signs. Practically all of the 110 booths were occupied, some exhibitors utilizing as many as three adjoining unit spaces. Making the rounds of the hall, the following exhibits attracted attention:

Absolute Contactor Co., Elkhart, Ind. An elaborate display of contactors, which are glass tubes containing a small amount of mercury and having sealed-in contacts. Rocking the tube makes or breaks contact in different ways for many purposes. This display was comprehensive and included several novel applications of contactors to circuit control.

Chrobaltic Tool Co., Michigan City, Ind. An interesting exhibit of heat-resisting alloy castings, showing many combustion chambers that have been developed for oil burner use. The company was represented by W. B. Sullivan, vice-president and general manager; L. H. Whiteside, Chicago representative; J. W. Mull, Jr., Indianapolis representative; C. M. Conner, Philadelphia representative.

Webster Electric Co., Racine, Wis. A simple but interesting display of transformers that have been developed especially for oil-burner ignition purposes. The exhibit was in charge of E. M. Ford, sales manager; V. D. Ott of the engineering department and C. T. Harnett, factory representative. S. A. Loeb, president of the company and A. C. Kuckner, vice-president and chief engineer, were also in attendance.

Harding Heat Unit, Chicago, Ill. Exhibit consisted of a boiler and burner unit for home heating with which, it is stated, combined efficiencies of 90% can be attained. The unit is cylindrical in shape and cased in planished iron with brass trimmings and presents a high-class appearance. The boiler is of special construction, the flue gases being taken from the boiler at the point of entry of return water and it is stated that extremely low stack temperatures are normally obtained. In attendance at the exhibit were Charles Venn, Henry Morton and Samuel B. Harding.

W. B. Wilde Co., Peoria, Ill. Type C burner and three sizes of the Type D. These burners are provided with either gas-electric or straight electric ignition and are designed to burn oils as low as 28° A. P. I. At the exhibit were W. B. Wilde, president; J. E. Martin, vice-president; E. J. Smith, sales; L. Aldrich, designing engineer; A. L. Coleman, service engineer.

Northern Oil Burner Co., Minneapolis, Minn. exhibited an automatic natural-draft oil burner complete with draft regulator. The company was represenetd by W. O. Horne and V. W. Brewer.

Super Oil Heator Co., Hartford, Conn. Type A Standard Super Oil Heator burner installed in the fire-pot of a boiler and a Model B burner. A cut-away section of the Heator was shown in which all running parts and their relations were clearly evident. There was also demonstrated a new type of strainer, using the precipitation principle for cleaning oil. The exhibits received a great deal of attention because of the novel features of the burner. E. Field White, vice-president and chief engineer; R. D. Barstow and E. A. Church represented the company.

Arthur H. Ballard, Inc., Boston, Mass. Ballard Junior burner, designed for oil of 28-32° A. P. I. and for handling from 200 to 7500 sq. ft. of radiation. This is comparatively a new burner, although designed by one of the pioneers in the oil-burner industry. Arthur H. Ballard, president of the company, and Charles Pole of the Newark, N. J., office were in attendance.

Ideal Oil Saver Co., Chicago, Ill. Sample devices designed to be placed in the flues of boilers to decrease the velocity of the flue gases. The exhibit was under the direction of George L. Cochran. F. D. Miller and Edwin H. Short were also in attendance.

Williams Oil-O-Matic Heating Corp., Bloomington, Ill. One of the well known Oil-O-Matic burners finished in white enamel and nickle, with a purple background and colored floodlights on the machine. In connection with the convention, the company also had an operating exhibit and convention demonstrator in another building where the burner was shown in operation. The company was well represented by the following: C. V. Williams, president; W. W. Williams, vice-president; Lawrence L. Smith, vice-president and general sales manager; R. D. Marshall and Earl Neswith, registrars, bureau of heat research; C. Meierhead, New York state division manager; A. R. Mann, east New York district representative; Ray B. Hammond, district representative central New York; A. Gillette, district representative western New York; A. M. Messinger, New York State engineer; H. E. Williams, Jr., distributor New York City; Carl Whidney, advertising manager.

Patrol Valve Co., Cleveland, O. Oil-burner safety controls, thermostatic valves and switches. The exhibit was in charge of E. J. Te Pas and V. J. Evans.

H. B. Smith Co., Westfield, Mass. No. 24 Mills cast-iron sectional boiler of the water-tube type, with sections cut away to show combustion space, fire surface and gas travel in order to demonstrate the characteristics of this design. In attendance were W. A. Thompson, P. C. Smith, Jr., S. K. Smith, C. K. Prince.

Gulf Oil Burner Co., Philadelphia, Pa. Grant-Gulf oil burner as a unit and several cut-away sections showing the salient parts of the burner. Representing the Gulf Oil Burner Company and the Grant Oil Burner Company were S. Silver, sales manager; William M. Braybrooks, chief engineer; Merell A. Squier, district sales manager; A. F. Van Pelt, vice-president of the Grant Oil Burner Company.

Dongan Electric Mfg. Co., Detroit, Mich. An attractive display of ignition transformers of both continuous and intermittent duty type. Also thermostatic transformers. The company was represented by C. Sam Swanson and B. L. Moore.

Tuthill Pump Co., Chicago, Ill. Internal-gear rotary pumps of new design in several sizes having capacities from 2/3 gal. per minutes to 50 gal. per minute. These pumps are guaranteed to lift against a suction head of 25-in. of mercury and are built with very close tolerances. The exhibit was in charge of G. B. Tuthill and O. L. Bock.

Bryan Steam Corp., Peru, Ind. Three complete boilers in different sizes; a skeleton boiler showing construction and internal arrangement and a cut-away boiler showing circulation scheme and method of heat absorption. George A. Bryan, president of the company, surrounded himself with a large group of representatives including George J. Wright, sales director; R. E. Slater, R. G. Garretson, E. T. Payne, James Davis, William Cole, R. W. Knee, G. A. Bottum, A. W. Severns, J. M. Knox, H. N. Nelson, W. M. Burroff, Porter Ward.

Wagner Electric Corp., St. Louis, Mo. An exhibit of split-phase and repulsion-induction motors, a feature of which was repulsion-induction motors operating so quietly the observer could not tell they were running without touching them. Those representatives present were: E. A. Forkner, manager small motor sales, St. Louis; E. M. Webber, Chicago; H. P. Whalen, Buffalo; M. E. Comstock, Boston; E. Lingard, Philadelphia.

General View of Exhibit Hall in Broadway Auditorium, Buffalo

M. J. Tierney Co., Rochester, N. Y. Teekorator, a portable incinerator. The exhibit was in charge of James P. Dower, Jack Tierney and M. J. Tierney.

American Radiator Co., New York. Detroit Lubricator Co., Detroit, and the Excelso Products Corp., Buffalo, all in the same booth. The American Radiator Company showed Ideal boilers for oil burning and Mercoid thermostats and controls. The Detroit Lubricator Company exhibited strainers, pumps and other accessories for oil burning. The Excelso Products Corporation had on display Excelso water heaters for oil burning boilers. With Homer R. Linn of the American Radiator Company were K. B. Thorndike and J. S. Snyder. P. S. Russel represented the Detroit Lubricator Company and R. E. Moore the Excelso Products Corporation.

American Blower Co., Detroit, Mich. Complete line of Sirocco blowers for domestic oil burners. J. B. Leonard, V. P. John and G. C. Polk represented the company.

Beckwith Co., Dowagiac, Mich. Summerheat burners, including a cut-away burner, with windows for examination of the internal parts. This burner was mounted on a furnace front and the functioning of its various parts was made very clear. The company was represented by F. L. Reighard, George Hirschfeld and Adolph Franz.

Titeflex Metal Hose Co., Newark, N. J. Interesting special machine carrying two lines of metal hose undergoing vibratory and flexing movements produced by the machine. The two sections of hose on the machine were oil-filled and the movements imparted to them, of course, were much more rigorous than any conditions that would obtain in any commercial use to which such hose might be subjected. Elbert E. Husted, sales manager, and F. W. Shumard, chief engineer, were in charge of the exhibit.

Janette Mfg. Co., Chicago. Motor blower units, with repulsion-induction motors and split-phase motors. Two types of Monroe oil pumps were also shown, one of which cut away to feature its operating parts, attracted a great deal of attention.

Combustion Fuel Oil Burner Co., Milwaukee. Industrial and domestic burners with gas and electric ignition. A special feature of the display was the demonstration of the flame distribution secured by the use of multiple nozzles. The new safety-control equipment also attracted much attention. Those present from the company were H. S. Rogers, vice-president; W. H. Rue, eastern representative; E. E. Gay, manager New York district; Frederick A. Jones, sales manager, New York district.

Hardinge Brothers, Inc., Chicago. Hardinge industrial burner, Hardinge domestic burner and a cut-away section of an industrial burner. One burner was operated to demonstrate the oil flow and atomization and was equipped to demonstrate the safety features of the burner. Franklin Hardinge, president; W. S. Givler, general sales manager, and B. H. Connor, factory representative, were at the exhibit.

Moore & Kling, Inc., Boston. Specialties consisting of foot valves, fill-pipe boxes, fusible links, lever shut-off valves, fill-pipe caps, street boxes and shut-off boxes. The exhibit was in charge of C. W. Moore, president.

May Oil Burner Corp., Baltimore, Md. Typical May oil burner for use on alternating current, with Honeywell controls; a domestic burner for alternating current, with Minneapolis control, a commercial burner and a D. C. burner, with a special Minneapolis control. Headed by E. M. Fleischmann, president, the company was represented also by A. J. Fleischmann, secretary and treasurer; S. J. Wise, vice-president; C. P. Culbert, field sales manager; W. A. Webster, sales engineer; H. O. Hollard, field representative; R. E. Van Nostrand, factory sales. Many of the May dealer organization also were present.

W. S. Ray Mfg. Co., San Francisco, Cal. Ray burners of different sizes. Two burners of particular interest shown were, one a 1927 model and one a 1917 model. Except for detail, these apparently were identical. The walls of the booth were covered with photographs portraying Ray installations. The company was represented by W. R. Ray, president; B. G. Kauffman, Chicago district manager; James S. Anderson, manager of sales; D. Murray Foley, eastern representative.

Nu-Way Corp., Rock Island, Ill. Six sizes of Nu-Way burners, ranging in capacity from 200 to 10,000 sq. ft. of radiation. A number of important improvements on the Nu-Way were shown for the first time. The outward appearance of the Nu-Way burner has been made attractive with a cover enameled in various colors. Those representing the company W. A. Rosenfield, president, F. C. Vetter, M. M. Cruse, M. H. Braden, C. A. Hallgren, George W. Hodgson, R. Van Seggern, W. E. Brickman.

Automatic Home Heating Co., Pueblo, Colo. Two standard Baker No. 10 model "G" burners. H. F. Widdicombe, sales manager, L. R. Hinman, and fourteen members of the selling organization were at the exhibit.

Minneapolis Heat Regulator Co., Minneapolis, Minn. Complete line of Minneapolis Protecto controls, including the Protectostat, Pyrostat, Protectorelay, room thermostats and boiler controls. Exhibited for the first time was the No. 5 anti-siphon magnetically-operated oil valve and the 10 OB oil valve, particularly designed for high-low flame burners. The central feature of the exhibit was a dummy oil burner completely equipped with Protecto controls, illustrating the positive ignition timing and the complete recycling on ignition failure. A particularly interesting feature of the display was a model of the new factory recently completed. Representatives of the company were: B. L. Boalt, secretary; C. B. Sweatt, treasurer; F. S. Denison, chief engineer; John W. Paulding; George D. Kingsland, New England branch manager; Arnold Michelson, Philadelphia branch manager; Chris Jensen, New York branch; F. H. Smith, Boston branch; D. G. Spahr, L. W. Cunningham, D. J. Peterson, of the industrial and engineering department.

Fuel Oil & Temperature Journal, New York, publishers of Fuel Oil, had on display copies of the magazine and technical books dealing with oil burning. The exhibit was in charge of C. F. Olmstead, K. H. Follman, A. R. Coburn, L. D. Becker, A. G. Winkler of Chicago, S. L. Calhoun of Pittsburgh.

Preferred Utilities Mfg. Corp., New York. New automatic dampers developed by the company, designed to provide an exact draft regulation. The rest of the exhibit consisted of specialties such as combination flush and fill boxes, street boxes, swivel vent protectors and a relief valve. The corporation was represented by R. S. Bohn, G. P. Gregory, J. S. Kaplan and H. E. Lake.

Silent Automatic Corp., Detroit, Mich. As a central point in this display a Silent Automatic burner was so set up with colored art glass and a swirling light that it produced a realistic imitation of the burner in full flame. There were also displayed complete detail parts of the burner and a cut-away model. The background of the exhibit was inset with many triangular mirrors producing a spectacular and stage-like effect. W. F. Tant, president, and K. B. Segall, vice-president of the company, presided at the booth and were assisted by a large number of Silent Automatic representatives, including J. L. O'Brien, manager of installation and engineering; E. R. Campbell, sales manager; H. M. Soyster and S. Fitzgerald, sales department; R. W. Beckett, J. Harris, Otto Thiel, engineering department. The Boston representatives were W. J. Debler, W. A. Hall, George Burns, C. A. Parks and H. Rapoport. Representatives from the Detroit branch were G. P. Gessell, F. Jordan, S. S. Pirie, L. E. Day and D. Rodman. W. A. Almy was the Philadelphia representative present. The Chicago branch was represented by J. R. Bates. H. A. Tiffany, Paterson distributor, and members of his sales force were among the representatives.

Electrol, Inc., St. Louis, Mo. The exhibit, consisting of a Standard Model "T" burner and a white cut-away Model "T" burner, was built up around a large and beautiful reproduction of the medallion trade mark of "The Master Furnace-Man" in which was set a burner. W. T. Koken, president, presided at the exhibit and the company was further represented by L. L. Scott, vice-president; R. S. Beale, director national sales; G. R. Koeln, director national service; G. L. Toohey, district representative; R. L. Pryde, district representative and R. H. Syner, production manager. In addition to the above, there were in attendance at the convention over 60 Electrol representatives from various parts of the country.

Liquidometer Co., Inc., Long Island City, N. Y. Complete line of distance-reading liquid-level tank gauges. C. A. deGiers, president, and A. J. White, of the sales department, were present.

Cook Electric Co., Chicago, Ill. Safety automatic oil-fuel pumps, controllers for oil burners, anti-syphon valves, low-pressure by-pass valves, oil-fuel gauges for outside or inside tanks, radio clarifiers, and metal bellows. Headed by George R. Folds, president, the company was represented also by John F. Jaap, L. M. Persons, D. C. McKee, E. D. Swanberg, A. M. Wilkins, and A. Procknow.

Sword & Kimber Co., Philadelphia, Pa. A 1927 Sword electric-oil burner. The exhibit was in charge of I. M. Nelson, sales manager, and during the convention James B. Sword, W. M. C. Kimber and H. N. Thorn were in attendance.

M. George Tigar, Floral Park, S. I. Model A Series 500 Berggren oil burner and a Model A Series B 100 burner, both featuring the Berggren rotary pump and blower. The exhibit was in charge of M. George Tigar and assisted by Charles Johnson, factory engineer.

American Machine & Foundry Co., Brooklyn, N. Y. Complete line of A M F rotary fuel-oil pumps built for direct connection to high and low-speed motors. Several sizes were shown capable of handling 14° to 46° A.P.I. oil against 150 lbs. pressure and having capacities from 20 to 200 gal. per hour for oil-burner service and from 10 to 125 gal. per minute for transfer service. The company also showed hand pumps for gasoline, oil and water. The exhibit was in charge of C. E. Anderson.

Jefferson Electric Mfg. Co., Chicago. Grounded and insulated-type ignition transformers, also a complete line of low-voltage transformers for operating electric controls on oil burners. Those representing the company were E. G. Goddard, W. C. Samuel, J. C. Daley and A. R. Johnson.

Honeywell Heating Specialties Co., Wabash, Ind. This company had an elaborate display of oil-burner controls, thermostats, motor switches, electric oil valves, combustion safety-controls, masterstats and other dual-control limiting devices, as well as Honeywell Aerofans for warm-air installations. At the exhibit, during the convention, were Mark C. Honeywell, president; Willard A. Huff, secretary and treasurer; A. P. Mudgett, manager of sales; A. H. Loghry, assistant manager of sales; Paul F. Shivers, chief engineer, D. W. Rodibaugh, K. F. Rausch, W. J. Hajek, C. S. Meikle, R. P. Flower.

Monitor Furnace Co., Cincinnati, O. Special nickel-plated Monitor electric oil burner, designed to show all parts of the burner in operation. Representatives present were: W. R. Koehler, A. C. Emerson, W. W. Chamberlain, W. J. Shibley, Lloyd Rickert, and William H. Gibson.

McDonnell & Miller, Chicago. The exhibit consisted of a complete line of Duplex water-feeder and Duplex low-water and pressure switches, also three new units, a vapor switch for pressure control only on vapor systems, a low-water cut-out which affords protection against low water in boilers operating up to and including 100 lbs. pressure. E. N. McDonnell, L. B. Miller, O. F. Carlson of Chicago and W. E. DeYoung, of New York, represented the company.

American Schaeffer & Budenberg Corp., Brooklyn. The company exhibited American anti-siphon valves, American by-pass valves and drip protecting valves, tank gauges and pressure gauges. A working model demonstrated the use and efficacy of these devices. The representatives of the corporation were A. E. Campbell of Brooklyn; F. H. Hapkins of Worcester, Mass.; C. H. Mosher of Buffalo, N. Y., E. F. Nordstrom of Brooklyn, N. Y.

Century Electric Co., St. Louis, Mo. The company displayed motors of all types from 1/6 H.P. to 1 H.P. A panel illustrating the "Century" wool yarn system of lubrication. Repulsion-start induction and split-phase induction single-phase motors running and connected to meters showed the characteristics of the various types. The company was represented by E. L. Kenney of Rochester; D. H. Schacht of Buffalo; C. O. Hedges of St. Louis and T. Elder of St. Louis.

Morgan Gage Co., Rockaway, N. J. This company showed an interesting line of direct-reading gauges for indoor and buried oil fuel tanks. This company was represented by E. D. Merikle, G. C. Babcock, Jr., J. M. McKay, L. L. Mabie.

K. W. Ignition Corp., Cleveland, O. This exhibit consisted of a number of special ignition transformers for use with oil burners. R. J. Eiseman, H. C. Schroeder, C. Albracht and J. A. Williams represented the company.

Bunting Iron Works, Berkeley, Calif. This company exhibited a complete line of Simplex oil burners, which have been marketed on the west coast for a number of years. The exhibit was in charge of H. L. Delaney, sales manager, and J. H. Blake, Jr., of the Simplex Oil Heating Corp. of New York, eastern distributors of the manufacturing company.

Economy Heat Unit Company, Minneapolis, Minn. Three models of "In-the-door" oil burner. L. H. Fawkes, president, and C. M. Stroud, vice-president, represented the company.

Consolidated Boilers Corp., Benton Harbor, Mich. This company displayed an interesting cut-away model of the Johanson duplex boiler, designed for use with oil and coal. The ruggedness and high-class construction of this boiler attracted attention. The company was represented by George W. Larkworthy, president, Arthur A. Baushke, manager, and Spencer A. Merrell, sales manager.

Petroleum Heat & Power Co., New York. As a background for its booth the company had a silhouette of the Metropolitan building in which Petro equipment is installed, with a foreground showing small residences, the entire decorative scheme being illuminated. There were exhibited a standard L-D-1 Model,

with accessories mounted and electrically operated. A standard turbine burner, with register mounted on tripod, was also shown as representing the industrial equipment of this company. This turbine-driven cup burner is capable of burning as high as 250 gal. per hour. E. H. Shea, manager, domestic department, was in charge of the exhibit and the company was also represented by J. N. Macrae, chief engineer; J. C. Barber, factory manager, and J. P. Farley.

Wayne Co., Ft. Wayne, Ind. This company exhibited a complete series of the well-known Wayne burner and of the new mechanical refrigerator about to be marketed by this company. A line of water softeners was also on exhibition. The company was represented by E. A. Robertson, L. A. Clark, B. S. Mygrant, H. A. Dickinson, Sam H. Lesh and Harold Vallieu.

Aetna Automatic Oil Burner, Inc., Providence, R. I. This company displayed a full line of standard domestic Aetna burners, with Minneapolis controls and expanding gas pilot. A special cut-away model showed details of construction. An interesting feature of the exhibit was an 80-in. industrial model capable of firing a 300-H.P. boiler. There was also an operating model of a siphon breaker and anti-flooding device for use with any pump-equipped oil burner. John Scheminger, Jr., president; J. E. Terhune, general manager; H. R. Holbrook, production engineer; A. W. Suiter, chief engineer; T. W. Lietz, general manager Aetna Utilities, Chicago; L. M. Proctor, factory representative, represented this organization.

The Heating and Ventilating Magazine, New York. The focal part of the booth was a 6 ft. facsimile of the third edition of "House Heating With Oil Fuel." The exhibit was in charge of Gustave Petersen, general manager, P. E. Fansler, associate editor, George A. Brown, eastern advertising representative; C. W. Presdee, western manager, and Sidney Smith, representative.

Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa. This company had an interesting display of single-phase motors for oil-burner applications, together with a line of small protective switches. Representing the company were F. E. Foisey, J. E. Smith, George Rubb, E. Brenner and T. R. Ralph.

Frank A. Holby Corp., New York. This company displayed a pump and fan set and turbine burners for low-pressure air atomizing to burn 14°-16° oil. There was also displayed a marine type turbine burner, a steam atomizing burner, regulator and a complete line of strainers. W. H. Holby, vice-president; J. T. McTarnahan, field engineer, and G. J. Woehrlin, chief engineer, represented the company.

Lawrence May Oil Burner Co., Flushing, N. Y. This company exhibited an automatic oil-burner with electric ignition without radio interference. The burner is wired completely in the factory and is shipped as a unit so that installation only requires setting of burner, connecting oil pipes, current supply and thermostat. The exhibit was in charge of Lawrence May.

Iroquois Electric Refrigerating Co., Philadelphia, Pa. This exhibit included a snowball demonstration machine, an Iroquois electric refrigerator unit in Bohn box and an apartment house unit complete. Representing the company were V. C. Kylberg, special representative; A. H. Fries, service engineer.

General Electric Co., Schenectady, N. Y. This exhibit was based upon motors and ignition and control supply transformers carrying the well-known "G-E" trademark. Representative items of each line were exhibited. An interesting demonstration of the effect of ignition transformers on radio equipment was made with a special set-up by which visitors to the booth were able to "listen in" on a receiver, set in close proximity to several transformers. By switching these transformers on successively, the amount of interference was made audible. Representing the General Electric Company were T. H. Reeves, in charge of the exhibit; A. J. Francis, manager, George Bauer and A. F. Welch, engineer of the fractional H. P. motor department; G. G. Jeter, sales manager, transformer accessories, Pittsfield, Mass., and F. A. Frederickson, motor specialist, of Buffalo, N. Y.

Fluid Heat Corp., Baltimore, Md. This company exhibited a Model 0 fluid heat burner, a vertical atomizing burner using 26° oil, designed for domestic installation. There was also shown automatic shut-off valves for fire protection on industrial oil-burner installation and the fluid heat anti-siphon valve for domestic burners. A. C. Marshall, president of the company, was assisted by J. C. Butler and C. S. Shaffer.

Teesdale Mfg. Co., Grand Rapids, Mich. This exhibit included three automatic TU oil pumps, one type R automatic pump with a capacity of 75 gal. per hour, a type H unit for mounting on Williams Oil-O-Matic burner and a type H pump with glass end plate for observing operation. Representatives of the company were C. H. Teesdale, president; C. R. Rich and Frederick E. Mundt.

Federal Gauge Co., Chicago, Ill. This company exhibited a complete line of Mercoid electric controls and featured the exhibit with the initial showing of three distinctly new devices; the Mercoid Visaflame, an oil-burner safety control, reacting only to light from the burner flame; the Mercoid combination pressure control and low water cutout; the Mercoid three-position float switch for tank oil-level control. Those present were L. H. Van Ness, president; N. J. Allaben, vice-president; J. W. Owens, vice-president, W. C. Capen, vice-president; E. J. Holland, secretary; I. E. McCabe, chief engineer; William Crawford, experimental engineer; A. N. Schultz, electrical engineer; J. N. Derby and G. G. Van Ness of the sales department.

S. T. Johnson Co., Oakland, Calif. Full line of Johnson domestic and industrial burners, from the new Johnson "Club" burner, for the smallest boiler and furnace, to the larger industrial units. An entire series was mounted on backwards representing boiler fronts. S. T. Johnson, president, presided over the exhibit and was assisted by L. W. Sage, Rochester, N. Y.; F. M. R. Malmstedt, Amityville, L. I.; J. F. Siegel, New York; D. W. Ashton, Buffalo; Fred Shaw, Worcester, Mass.; Mrs. F. C. Staples, Chicago; J. C. Johnson, Oakland, Cal.; N. W. Wilson, Philadelphia; C. C. Rich, Mount Vernon, N. Y.; T. E. Carson, Baltimore, Md.; S. R. Hardwick, New York; J. P. Mahoney, Amsterdam, N. Y.; Frank P. Harbin, Washington, D. C.; Fred C. Staples, Chicago; R. T. McComas, Philadelphia; C. C. Sessions, Ann Arbor, Mich.; E. W. Hunter, Washington, D. C.; O. S. Travers, Baltimore; F. J. McNamee, Baltimore; George W. Neale, Tampa, Fla.; Paul Unger, Chicago; L. E. French, Sebastapol, Cal.; J. H. Liedtke, Cleveland, O.; Herman Brandeles, Utica, N. Y.; Mr. Traub, Brooklyn, N. Y.; F. M. Flanigan, Brooklyn; Mr. White, Springfield, Mass.; Fred Woolston, Toronto, Ont., and Louis Gendron, Hull, Ont.

Milwaukee's Fifth Annual Home Show

Milwaukee's Fifth Annual Home Show, held March 19 to 26, inclusive, under the auspices of the Milwaukee Real Estate Board, was the best show of its kind Milwaukee has ever had.

The heating industry was well represented in that the number of oil-burner manufacturers exceeded any other one class of exhibitors. The burners on display included: Nu-Way, Oil-O-Matic, Combustion, Lammert industrial, Gill, Round Oak, Pascoe, Quiet May, Sundstrand, A.B.C., Baker, Electrol, Hardinge, and Nokol.

Honeywell controls and Minneapolis heat regulator controls were shown, and insulation was exhibited by Universal Gypsum & Lime Company and Celotex Company. L. J. Mueller Furnace Company exhibited furnaces and boilers, and R. J. Schwab & Sons Company exhibited furnaces and boilers. The Chamberlin Metal Weather Strip Company had a booth and the Kleenburn incinerator was on display.

Among the members of the Home Show Committee were Frank Meadows, of the Meadows Heating Company, and Henry Schwab, of R. J. Schwab & Sons Company.

New Bulletin on the Domestic Oil Burner

The Department of Agriculture has published Department Circular 405 under the title "The Domestic Oil Burner." This bulletin was prepared by Arthur H. Senner, assistant mechanical engineer, Division of Agricultural Engineering, Bureau of Public Roads. The preparation of this bulletin was made possible by contributions from the Bureau of Home Economics because of the widespread interest that has been taken in oil burning in the home. The bulletin is comprehensive in scope, covering the subject of oil fuels and oil burners with a number of comprehensive sub-divisions. It is well illustrated with drawings and photographic reproductions, and the text is an excellent presentation of the various phases of the subject for the average reader to whom the booklet is addressed. The headings under which the circular is divided are as follows:

Oil Fuels—Origin; distinguishing characteristics; specifications; production; future of oil fuels; effect of grade of oil on economy; handling and storing oil at the home.

Oil Burners—Classification; ignition; automatic devices for control of burner; selecting an oil burner; adjustment of burner; the heating plant; combustion space requirements; efficiency; boiler design as affecting overall efficiency; cost of heating with oil and coal; care of burner; improvements possible with existing boilers; safety; summary.

DESCRIPTIVE BIBLIOGRAPHY ON OIL AND FLUID FLOW AND HEAT TRANSFER IN PIPES, by Joe B. Butler, Associate Professor of Civil Engineering, is the title of a new technical series bulletin, published by the Missouri School of Mines, Rolla, Mo.

This bulletin of 62 pages lists and describes 370 references to published articles and books. A short article on the flow of oil in pipes gives formulas, data and procedure in solving problems.

All articles with data on friction loss and heat transfer in oil flow are included. Of the articles on flow and heat transfer in pipes of water, air, steam, and gases, only those with data pertaining to fluids in general are listed. Articles on critical velocity, viscosity and viscosimetry are included if they have applications to oil or fluid flow in pipes.

In 1914, Stanton and Pannell experimentally established for fluid flow in pipes that the friction factor in the ordinary hydraulic formulas is a function of the ratio of the inside diameter of the pipe, times the average velocity of flow, times the specific gravity of the fluid, divided by the absolute viscosity of the fluid. Curves showing this relation over both the streamline and turbulent régimes of flow are plotted from experimental data on water, air, oil and steam. The author lists 51 references having data on curves applicable to oil over both régimes of flow.

Copies of this bulletin may be obtained by writing to the librarian of the Missouri School of Mines, or to the author.

Health and Ventilation

By Peter H. Bryce, M. D.

1. House Atmospheres or Artificial Climates

THE chemist tells us that the uncontaminated atmosphere of open spaces is composed of two principal elements—oxygen and nitrogen—as a mixture and not a chemical compound, with three parts of carbonic acid in ten thousand parts of air. As a mixture it is fitted to receive and hold other gases, as water vapor and those impurities given off as volatile matters from decomposing dead organic substances. But, in addition to such gases, the atmosphere may carry impurities from furnaces and various industries, which give carbonic acid, carbon monoxide, sulphur dioxide, chlorine, arsenical and other gases, which are noxious, and become harmless only when greatly diluted. Along, however, with such gases the atmosphere may contain enormous quantities of solid particles in suspension, such as atmospheric dust, the most obvious of which are soot from thousands of furnaces, and the innumerable bacteria and spores of plants, swept into the air by winds from streets and yards, deposited there by animals, whether human or ferine.

Such, then, is the atmosphere as it enters dwellings to-day in our cities and towns. This atmosphere becomes a human environment manifestly quite different from that of normal air. But, owing to the fact of the free movement of outer air caused by winds, varying from a gentle zephyr to a gale, such an atmosphere has notably different physical conditions from that in closed dwellings and which affects directly the comfort and health of inmates.

The most obvious difference is that of the temperature between the air at the floor and at the ceiling in rooms, this being often as much as 8° F. This difference cools the feet and head unequally, as compared with the outer atmosphere, where the air movements subject the whole surface of the body equally to the same temperature. Associated with this difference is the effect on comfort and health from the varying loss of heat by different areas of the surface of the body, due to the less humidity, ordinarily, of house air.

Thus, while house air at 60° F. contains relatively more moisture than air at 75° F., it abstracts more body heat by conduction, while, at the latter temperature, which is capable of holding double the moisture, an excessive amount of heat is lost through evaporation, both from the surface of the body and from the membrane of the throat and lungs. Indeed, experiments have shown that house air between 60° and 70° F. supplies the optimum of conditions for inmates dressed in the ordinary manner and living a largely sedentary life; when the temperature at the floor and ceiling does not vary more than 2°, when the relative humidity is at from 50% to 55%, and when the air is in gentle movement at 1 ft. or 2 ft. per second, so displacing the warm breath given off from the mouth and nose.

THE writer proposes, in this series of articles, to deal with the health of the individual, and hence with that of his family and community, as influenced by the conditions of the house atmosphere or the artificial climate in which he regularly lives. The least-informed person knows that he inhales with every breath what the physicist calls a gas, and that it supplies him with the air necessary to his existence. Born into it, he has utilized it every moment; yet, unless taught about it, he may be as ignorant of its meaning and importance, as a fish of the natural element it lives in, and which is absolutely essential to its life.

Apart from accidental impurities, normal atmospheric air consists of the following constituents by volume:

	Out-door air Per cent.	Expired air Per cent.
Oxygen	20.76	16.03
Nitrogen	78.20	79.55
Argon	1.00	1.00
Carbon Dioxide..	0.03	4.30

PETER H. BRYCE, M. D.

PRESENCE OF EXHALED PARTICLES OF MOISTURE

In yet another respect the atmosphere of houses differs notably from that of free outer air, due to the presence in it of exhaled particles of moisture, from the throats and noses of inmates, which may contain great numbers of the microbes of some communicable disease, such as tuberculosis, diptheria or influenza. Owing to the few changes of room air during an hour, this condition exposes other inmates to mass infection to a degree impossible in outer air, where even a zephyr breeze of five miles an hour changes the air about a person some 25,000 times.

The epidemic of influenza, in 1918, fully illustrated the great dangers to nurses and other healthy persons from the air of hospital wards, crowded public assemblies and public conveyances. Abundant experimental work has also shown that the mucous membrane of the mouth and nose, in highly-heated rooms with dry atmospheres, becomes peculiarly susceptible to absorb infection, primarily because of the fact that a person breathing at least seventeen times a minute and exhaling, with each breath, some 30 cu. in. of air, almost saturated at 95° F., has abstracted therefrom an abnormal amount of moisture, thereby causing a local congestion or venous condition of lessened vitality in the tissues, whose resistance to the attack of inhaled microbes becomes thereby greatly decreased.

HOW CARBON DIOXIDE IS AN INDICATION OF THE CONDITION OF THE AIR

In yet another particular house atmospheres are artificial climates since the amount of oxygen in confined air, breathed by a large number of persons in the rooms, causes an increase in the carbonic acid present to the extent of three parts in normal air to even twenty parts in 10,000, as the writer has proved by experiments in the crowded holds of an emigrant ship at 4 A. M. Thus the carbonic acid becomes a measure of the organic odors, which, as emanations from the lungs and from the surface of the body, are distinctly injurious from their depressing effects on the nerve centers, even if not actually toxic.

Possessing the feeling of well being becomes a direct stimulus to the nervous system, infinitely more potent than can be measured by the most delicate physiological experiment. Experiments made on persons, crowded for various periods into closed spaces, would seem to indicate that it is rather the high temperatures reached by the immobile air, which create the intense nervous depression, since the movement of the room air by a fan, in large degree, does remove the uncomfortable sensations felt.

But enough has been said to indicate the chief differences which distinguish "house atmospheres" from the outer air. Common experiences, however, of the effects of such air have long since been known to social workers in the tenements of Glasgow, the cellars of Liverpool, and the slums of London and New York, measured by the effects, of crowded, filthy dwellings on the vitality of the unfortunate inmates, as seen in the death-rate and the pallid faces of the children at the end of the gloomy winter season.

VALUE OF OUTDOOR AIR FULLY DEMONSTRATED

Laboratory experiments indeed explain the relations between cause and effect, but none who has compared these children with the sturdy children of the rude cabins of a Highland glen, or the anaemic denizens of the eighth ward in

New York, with the sturdy shanty men of the Adirondacks, can have any doubt as to the full meaning of outdoor air in relation to health.

The writer has had abundant opportunities to compare the health of Indian children, resident in ill-ventilated boarding schools on the open northwest prairies, among whom tuberculosis has caused a large annual death rate, with that of the open-air schools of some of our cities, where hundreds of pre-tubercular children, dressed in fur coats, caps and fur-lined felt boots, grow inevitably into health, and has no illusions as to the full meaning of the fresh-air system of heliotherapy of to-day.

What he proposes, however, in this series of articles is to illustrate how that portion of the community, living in our great cities and towns, inmates of ordinary dwellings, and transported in crowded tram-cars and in the "underground," may be insured of comfortable surroundings in their churches, schools, theatres, and other public buildings. It will also be his purpose to show how, through the education of themselves and children, they may give to the younger generation a better appreciation of what an urban artificial life means and how they can best lessen or remove those conditions, naturally prejudicial to health, through learning to adopt the scientific control and management of the heating and ventilation of dwellings, whether they be homes, offices, factories or public buildings.

Electric Heating Element for Range Boiler

One of the most interesting novelties on view at the British Industries Fair this year (Britain's leading annual trade fair) takes the form of a new water-heating element. It consists of a thin metal strap containing the element, which may be instantly clipped around the ordinary domestic hot water cylinder and covered by an asbestos insulation. This device is instantly attached to any cylinder and connected to a convenient power plug, thus converting the old kitchen grate hot water system to electrical heating without any alterations whatsoever. The elements are provided in three different loadings, and sell retail at 25s. ($6.25) each. If its electro-thermal efficiency proves satisfactory in use it should enjoy a very wide demand.

Building Insulation Proves Fireproof Qualities

THE advantage of having a building insulation that is fireproof is well illustrated in the case of a Highland Park (Ill.) residence which has withstood the effects of a devastating fire without having its exterior damaged or even marred. This house, of frame construction, was built by Walter Wilcox. The type of insulation used was Insulex, which was poured between the studs and above the upper ceiling and formed a solid mass.

The house recently was completed, and was unoccupied when it was discovered that the interior was aflame and gaining headway. Before the flames could be quenched by the fire department, the entire upper floor had been destroyed, the partitions being burned down and the plaster and wallboard that had been used for plaster base had burned. The fire stopped there, having been checked by the insulation between the studs. In some instances the studs were charred, but none of them were badly damaged. The insulation above the ceiling also prevented the fire from breaking through, so that the exterior sustained no damage whatever, except that some of the windows were broken by the firemen during their work.

Exterior of Insulated Home After the Fire

The accompanying photographs, taken on the day following the fire, give evidence that a wooden house, properly constructed, can be made fire safe. The damage that was done to the interior where the ordinary partition walls had been used is illustrated, and will give an idea of the excessive heat that the exterior walls so successfully withstood.

How Effective Insulation Reduced the Fire Damage in this House

PROCEEDINGS OF THE THIRD ANNUAL THREE-DAY INSTITUTE FOR THE PLUMBING, HEATING AND VENTILATING INDUSTRIES, held under the auspices of the Carnegie Institute of Technology in Pittsburgh, on January 18, 19 and 20, 1927, are now available in bulletin form.

Lectures delivered by members of the faculty of the institution are published in full, and several of them are illustrated. The contents include "Corrosion of Metals" and "The Welding Process," by Robert B. Leighou, professor and head of the Department of Industrial Science; "Welding in the Plumbing and Heating Industry," by Samuel E. Dibble; "Plumbing and Heating Installation in Building Construction," by Clifford G. Dunnells, professor and head of the Department of Building Construction, and "Health as it is Affected by Plumbing, Heating and Ventilating," by Dr. H. Ryerson Decker, consulting physician.

Copies of the bulletin are available to those interested at $1.00 each.

CLASSIFIED DIRECTORY OF GAS PRODUCTS AND NAMES, together with members of the American Gas Association, has been published as Part II of the American Gas Association Monthly for April, 1927. In addition to the list of companies and their products, the directory contains an index of trade names. Size 6¾-in. by 10-in. Pp. 55.

Lowering the High Cost of Swimming

Baker Community House, St. Charles, Ill., Lowers the Cost of Maintaining a Swimming Tank by Heating Water Directly from the Boilers

By Thad Dean Wheeler

BACK in the days when the ole swimmin' hole was free to everyone, the dawn of a day when the menacing clouds of cost would cover the sky and raise a prohibiting finger at the youngsters who had heretofore besported themselves in its tepid depths was unsuspected.

The advent of the indoor swimming pool was at first considered a boon to mankind. It brought the ole swimmin' hole within the safe precincts of the Y. M. C. A., the community house, the club, or the exclusive hotel, where lovers of the water could find summer temperatures on zero days and a place to swim in cities far removed from adequate bodies of water. But the difficulty encountered was not so much the investment required to build in the tank and fill it with clean water for this healthful sport, but to *keep* it filled with fresh water at the proper temperature.

Laws require that the water of public swimming pools be frequently changed, while in some localities the water is of such a nature that varying amounts of chlorine or other germicidal agent must be added in order to counteract the tendency of the water to typhoid. In addition to this, the water must be maintained at certain temperatures which are conducive to the comfort of the swimmers.

The usual practice is to drain the tank at fixed intervals, clean it, and re-fill it. This usually requires a check on the use of the tank of from eight to forty-eight hours. Then, after the tank is re-filled, the water must be kept at the proper temperature. This is generally done by running steam coils direct from the boilers along the bottom of the tank, or by maintaining a constant flow of warm water from a separately-fired water-heating unit, which is drained through an overflow basin when it reaches a certain level.

The expense of either of these methods will be apparent to anyone who has experienced the cost of keeping water heated either by steam coils or by a separate unit. Steam coils used in this manner mean just so many more feet of radiation to the building and consequently greater capacity of the boiler, and the separate water-heating unit requires not only additional investment, but frequently another grade of coal and the attendant labor. The *cost of the water* also should be considered, for practically all of the large and many of the smaller cities and communities have adopted water meters which fix the cost of water by the gallon instead of by a flat water tax.

Baker Community House, St. Charles, Ill.

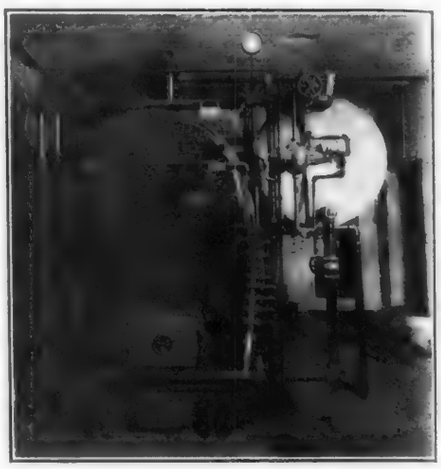


Fig. 1. Installation of BST System in Baker Community House

At the Baker Community House, St. Charles, Ill., the problem of low cost was successfully solved by using the heating boilers as a means of keeping the water at the required temperature.

It will be seen in Fig. 1 that in the Pacific type boiler, which heretofore had been used for heating, a succession of pipes has been run through the boiler water. The cold water travels from the filters, shown in Fig. 2, directly to these tubes submerged in the boiler water. Having traversed this succession of tubes, it runs to the reserve tank, where it is used by the shower rooms, dining-rooms, and the rest of the house, and for constant replenishment of water in the swimming tank.

It will be noted, however, that in Fig. 2 a pair of pumps is used. The purpose of these is to enable the city water

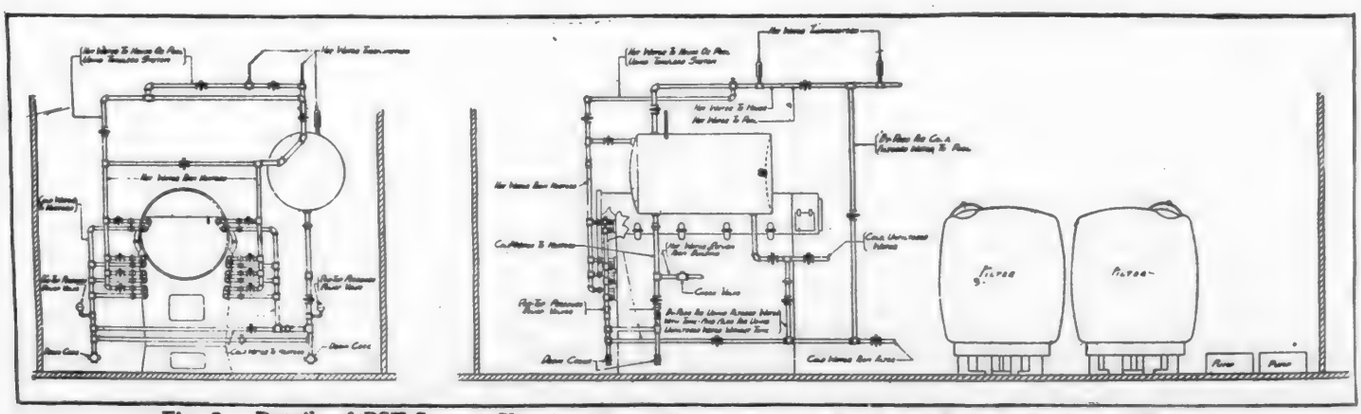


Fig. 2. Details of BST System Showing Water Connections at Right and Left of Firebox of Boiler

supply to be shut off and the water from the tank to be circulated constantly from the tank, through the filters, to the tubes, where it is re-heated, and again returned to the tank. (Fig. 3.)

An appreciable saving in water is effected by this method. No water is wasted by allowing the excess water to drain itself off through an overflow basin. Instead of this procedure, the water, forced by the pumps, is circulating continually through the filters and through the tubes. The temperature variation is kept at a minimum, and the loss of B.T.U. in the heating boiler is noticeably small, showing that during most of the time the system is utilizing the boiler's excess heat.

Tests are now being made, the company states, to determine how much more fuel is necessary to maintain hot water in winter with a BST submerged water heating system. Estimates made by the company, based upon available data, indicate this amount to be from 6% to 8% for the usual type of apartment building.

In summer, however, it is figured that the fuel consumed, together with refuse, is about 50%, on the average, of the amount generally required by a separately-fired water heating unit.

This system of water heating was installed at the recommendation of Messrs. Wolff, Harper, Sextor, and Truaze, architects. It was planned and installed under the direction of Jacob Erickson, chief engineer of Ferguson & Lange Foundry Company, Chicago. The system is manufactured and sold by this firm under the name of BST submerged water heating system.

Fig. 3. Swimming Tank at Baker Community House, St. Charles, Ill.

Legal Decisions

Action Arising Out of Painting of Radiators

The contractors for the installation of a heating plant agreed to paint all radiators and exposed pipe with two coats of a specified radiator enamel of a color to match the decorations. Disregarding this, however, they covered the radiators with a coating of aluminum bronze. The architect demanded that they use the enamel specified, and they contracted with the interior decorator on the building to apply it. This was done, and two weeks afterwards the heating job was tested and steam turned on. When the radiators became hot blisters arose on them, marring the finish so that they had to be refinished. This the interior decorator refused to do except at the heating contractor's expense. The latter did the work and, in an action by the interior decorator for enameling the radiators, counterclaimed for the expense of removing the old finish and applying the new.

Under the evidence, it was possible to attribute the blistering to three causes, for one of which plaintiff would be responsible, for another defendant would be responsible, and, for the third, neither would be responsible. If the enamel applied, because of its imperfections, caused the blisters, neither plaintiff nor defendant was responsible, but those who specified that it be used. If, as the plaintiff alleged, the defendant's failure to clean the radiators from rust, dirt, and moisture before applying the aluminum bronze, or if the bronze, because of its imperfections or unsuitableness, was the cause of the blisters, the defendant was responsible. The plaintiff was responsible only in the event the blisters were caused by lack of care and skill upon its part in applying the two coats of enamel. The jury found for plaintiff and judgment on the verdict was affirmed on Appeal.—F. A. Clegg & Co. v. Pell, Kentucky Court of Appeals, 287 S. W. 942.

Power of Municipality to Pay for Work and Materials Furnished, Although Contract Therefor Held Illegal

A contract was awarded by the City of Buffalo for certain heating and plumbing work, with six separate items as extras. Subsequently, in a taxpayer's action, this contract was held to be illegal because of the contractor's failure to submit separate bids on each of the six extras, and the city was permanently enjoined from making further payment to the contractor "under the contract in question." When the permanent injunction was granted, the contract had been completed and the contractor had been paid all that was due thereon, except about $7,500. After the New York Court of Appeals sustained the injunction, the city counsel of Buffalo passed a resolution directing the payment of the $7,500 to the contractor upon the ground that the city had received the benefits of his labor and materials, and was therefore under moral obligation to pay for them. The taxpayer, who had prosecuted the action resulting in the permanent injunction against the payment under the contract, served notice on the disbursing authorities that payment, even under the resolution of the city council, was illegal, and the commissioner of finance and accounts declined to pay without a court order. The contractor applied to the court for a peremptory order of mandamus to compel payment of the amount.

The illegality of the payment under the resolution was based upon three claims: First, that it would be a violation of the injunction; second, that while the State Legislature has power to authorize the payment of an equitable obligation, it cannot delegate such power to municipalities; and third, that this payment would grant extra compensation to a contractor, which is expressly prohibited by section 20, subd. 5 of the New York General City Law.

The New York Supreme Court, Erie County, in re Shaddock, 128 Misc. 616, 220 N. Y. Supp. 113, holds that none of these claims is tenable. The proposed payment is not "under the contract," but by resolution based upon what was determined by the council to be an equitable or moral obligation. It is therefore not a violation of the injunction. The power of municipalities to recognize claims such as this is held to be clear under section 20 of the General City Law. Subdivision 5 of that section, which provides that a city "shall have no power * * * to grant extra compensation to any * * * contractor," is held not to apply to this case, which is not a case of extra compensation. The application was therefore granted.

American Engineering Standards Committee, New York, announces that a revision is under way of the refrigeration safety code. This revision is in charge of F. E. Matthews, chairman of the A. E. S. C. sectional committee. Ever since the adoption of the original code by the American Society of Refrigerating Engineers, nearly twenty years ago, a large standing committee has been maintained, functioning periodically in revising the code, as the development of the art and other conditions required. The code, in its present form, was adopted by the A. S. R. E. in December, 1925. For the revision, the personnel of the sectional committee, which now has 35 members representing 23 organizations, is being reorganized. Constructive suggestions for the improvement of the code are particularly welcome at this time while it is undergoing revision.

Gas Industry Faces a Problem in Merchandising Heating Appliances

IN the heating business, the same situation is developing that now occurs with the manufacturers of the more commonly used gas appliances, such as water heaters, ranges, etc. More makes of gas boilers and furnaces already are on the market than reasonably can be merchandised by any one gas company. The real problem is to select those makes that seem to be the best fitted for the conditions encountered in the potential market, and, at the same time, not to discourage the other manufacturers in the field who have suitable appliances to offer. Much development is yet to be done, and since the manufactured gas companies are doing most of the heating appliance selling and servicing in the territories they serve, they are in the best position to detect the shortcomings of the present equipment and direct the improvements.

The problem of competing for business with several manufacturers' agents whose appliances are not sold by the gas company is already a reality in the larger cities. This is a problem that should receive grave consideration on the part of the various sales managers, and policies must be evolved that will produce an harmonious situation. Both the manufacturers and the gas companies are working toward a common end; that is, increased sales of gas for home heating. Those manufacturers who are not fortunate enough to be represented by the gas company, should not be regarded as competitors, and all should receive the advantages of the gas companies' experience toward suggested improvements, as well as the benefits of their service organization. No distinction based on make of appliance or where it was purchased should be made in rendering service to heating customers.—*Glenn C. Carnahan.*

Holland Tunnel Air Test Criticized

Doubts as to the adequacy of the ventilation system for the Holland vehicular tunnels under the Hudson River are expressed by a committee representing the New York Board of Trade and Transportation, based upon the recent tests carried out in one section of the tunnel, as reported in last month's issue. According to this committee, of which John F. O'Rourke, builder of the Pennsylvania Railroad tubes under the Hudson, is chairman, the effect of the exhaust blowers in removing the smoke from two test candles was not satisfactory.

"The candles," states the committee, in its report, "took between one and two minutes to burn and the smoke was not entirely clear from where it originated from a like period. Much of the smoke drifted about 200 ft. with the slow air current which was moving toward the east portal and formed a haze in the tunnel beyond that distance, which marked the end of the 650 ft. of tunnel in which the ventilating apparatus was in operation. This smoke soon after disappeared, as is the nature of smoke whether removed or not.

"The next test was of two smoke candles which were ignited and dropped into the expansion chamber slots on each side of the roadway. The smoke from them came out in strong jets which met at the middle and mingled with the air in the upper half of the tunnel, spreading out both ways.

"The exhaust ducts in the roof took some of this out but so imperceptibly that the flow into the exhaust openings in the roof was not visible. The same drift to the east happened as before and the same time elapsed before the air was clear where the candles had been burned, with the same haze of smoke at the east end of the section under test.

"Our conclusion is that the tests fall far short of what, should prevail in case of a serious fire in the tunnels. Each of the tests consumed less than 2 lbs. of a slow-burning fuel. In our opinion, a satisfactory test of an ordinary fire should involve the burning of at least 15 gal., or approximately 100 lbs. of gasoline."

Ole Singstad, chief engineer of the tunnel, is confident, however, that the tunnel air will be safe with the ventilating system as installed.

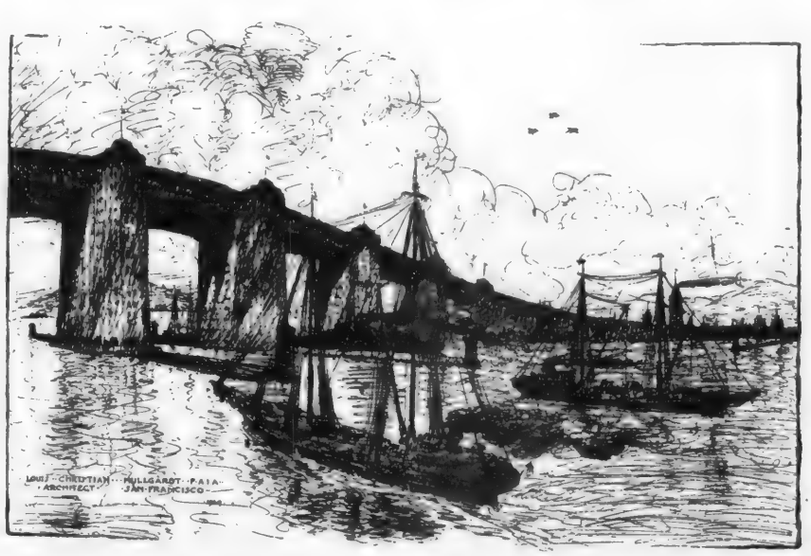
"We have really made no attempt," he said, in commenting upon the O'Rourke report, "to try out the ventilation system yet. The power house connection will not be ready until May 15. Then we will give the system a real test. After a series of such tests we will know exactly what the fans will do. We are going ahead with our program regardless of outside criticism.

"Three weeks ago, when the first four fans were put in place, I notified the Commissioners that we would give them a trial. The Board of Trade committee asked if they could come along, and I said they might if they were interested, so they dropped in on the party. What they saw, however, was really no test at all of the whole ventilation system. It was ridiculous to regard it as such."

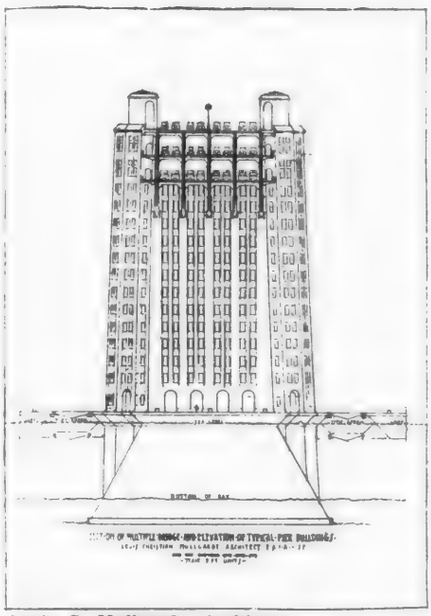
A Combined Bridge and Housing Scheme

A SCHEME for a bridge across San Francisco Bay, in which the supports would take the form of housings for the residents of either San Francisco or Oakland, has as least the advantage of providing a seashore atmosphere. This form of bridge construction is described as serviceable for every desirable purpose; its realm of utilization is unlimited and most economical. To ultimately convert the bridge supports into housings is not only feasible but logical, and can be done at minimum cost. The ground areas upon which they stand do not require to be purchased, and, therefore, when the foundations are built, they rest upon earth which is tax free. The steel frame work practically is complete, and the actual cost of such buildings is determined by walls, windows, doors, partitions, heating, plumbing, electric wiring, and whatever else is required for the lessee's needs.

These structures would have unrestricted light and air from all directions, and would be connected with state highways above and Pacific Ocean steamers and smaller craft which moor at their



Pen Drawing of Proposed Multiple Bridge



Louis C. Mullgardt, Architect

Section of Multiple Bridge and Elevation of Typical Pier Buildings

base. They may be palatial hotels or great factories, as distances are 500 ft. between piers. A multiple of highways, supported on many great buildings, are, perhaps, new in the world for which someone may wish to supply the capital, after the way is first made clear of all obstructions. *From The Architect and Engineer for March*, 1927.

University of Pennsylvania Establishes Course in Fuel Engineering

An insistent demand for fuel engineers with a clear understanding of the character and relative value of our fuel resources has prompted the University of Pennsylvania to establish a course in fuel engineering. This course will open September 30, 1927, in the mechanical engineering department of the Towne Scientific School, University of Pennsylvania.

Subjects to be covered in the course, which extends over one year, include:

a. Fuel resources.
b. Mining methods: preparation for market; distribution; storage and rehandling.
c. Composition and combustion of fuels.
d. Manufacture of special fuels.
e. Uses of fuels and specifications for purchase.
f. Furnaces.
g. Fuel sampling; analysis and calorimetry.
h. Fuel testing in heating and power appliances.
i. Domestic heating; cooking; smoke elimination.
j. Regulations affecting use of water power and of fuel resources.
k. Research.
l. Electives.

Dr. Robert H. Fernald, who is the director of the course, also has charge of the subjects covering domestic heating, cooking and smoke elimination.

Special lectures will be delivered by a number of men well known in the heating and ventilating industry. N. T. Sellman, engineer of utilization, Consolidated Gas Company, will have as his subject "Domestic Heating with Oil, Gas or Electricity." J. H. Walker, of the Detroit Edison Company, will deliver a lecture on "Central Heating Systems," and F. E. Pendleton, of the New York Steam Company, is scheduled for a lecture on "Distribution in Large Cities." Others on the instructional staff are H. O. Loebell, vice-president of the Combustion Utilities Corporation, of New York; A. C. Fieldner, chief chemist of the Bureau of Mines, and Henry Kreisinger, research engineer for the Combustion Utilities Corporation, New York.

The degree of master of science in fuel engineering will be awarded to each student who completes the course.

Carbon Monoxide and Ozone

OZONE has been proposed as a remedy for the carbon monoxide hazard in commercial garages and service stations, on the ground that it is capable of changing carbon monoxide directly into carbon dioxide. In view of this situation the Bureau of Industrial Hygiene of the New York State Department of Labor was asked to conduct experiments on the use of ozone to destroy carbon monoxide.

As a result of the tests the bureau is urging compliance with the letter of Code Rule 719, which is enforced as a part of the labor law in New York State, reading as follows:

"Every workroom in which carbon monoxide is emitted or created, or in connection with any process of manufacture, shall be provided with such ventilation that the carbon monoxide shall not exceed one-half part in ten thousand volumes of air in any occupied part of such work-room."

Dr. Carroll M. Salls, chemical engineer, describing the tests in the *Industrial Hygiene Bulletin*, states that a 10-cubic meter gas chamber was fitted with glass tubes for withdrawing air samples and for conducting carbon monoxide into the chamber. An 18-in. circulating fan and a 1.92-gram per minute ozonator were placed in the chamber and connected so that both could be started or stopped without entering the chamber.

The chamber was closed and leakage of air around the door stopped as completely as possible. Then illuminating gas contains 30% carbon monoxide was conducted into the chamber and mixed by means of the circulating fan until it contained about 13 parts carbon monoxide per 10,000 of air.

The supply of carbon monoxide was then stopped and air samples withdrawn at 10-min. intervals by means of a glass tube and a centrifugal air pump.

The air samples were analyzed by the Sayers-Yant pyrotannic acid method using a blood reagent made by diluting 6 c.c. of defibrinated steer's blood to 20 c.c. with saturated borax solution, then dilution to 120 c.c. with water.

When three samples had been withdrawn, the ozonator was started, and sampling continued at 10-min. intervals. The first three tests show a constant slow reduction in the concentration of carbon monoxide due to leakage out of the gas chamber. If there were a prompt and appreciable reaction of ozone with carbon monoxide, the curve would turn downward immediately after the ozonator was started, for there would be enough ozone discharged in the room in three minutes to react with all of the carbon monoxide in the chamber.

The first sample taken after the ozonator was started contained 4.7 parts carbon monoxide per 10,000 of air; and the following eight samples taken over a period of 80 minutes all showed definite amounts of carbon monoxide, the actual concentration gradually decreasing because of diffusion from the gas chamber at the same rate as before starting the ozonator.

These results agree with Franklin's experiments, for Franklin showed that the reaction between ozone and carbon monoxide at room temperature is very slow, a period of more than three days being required for complete reaction.

To further confirm these results, tests were made of the atmosphere in service stations where ozonators were in operation. As expected, appreciable amounts of carbon monoxide were found, and in two especially bad conditions amounts as high as three and four parts per 10,000 were found.

Even though carbon monoxide were promptly destroyed by ozone, a simple calculation shows that four ozonators would be required to destroy the carbon monoxide from each motor in operation. In this calculation every assumption is made that is favorable to the ozonator, *i.e.*, the 3:1 combining proportion in which each atom of ozone is active; motor operating only two hours a day while ozonator is operating eight hours; 1.5 cu. ft. carbon monoxide per minute per motor; and 1.92 grams ozone per minute from the ozonator.

In view of these facts it is difficult to explain the very beneficial results reported by some empolyees and proprietors. The psychological effect of a preventative measure that they can see and smell may have something to do with it. Ozone has been recommended in the practice of medicine for a variety of ailments, achieving apparently a degree of success in some cases, and it is just possible that future research will show that ozone is a valuable treatment for carbon monoxide poisoning.

N. F. P. A. Report on Heating and Ventilation of Garages

PROPOSED regulations for the construction and operation of bus garages, as drawn up by the Committee on Garages, representing a number of interested bodies, including the American Society of Heating and Ventilating Engineers, are being presented as a progress report at the annual meeting of the National Fire Protection Association, in Chicago, May 9-12, by H. E. Newell, chairman. The A.S.H. & V.E. representative on the committee is Owen N. Walther, of Philadelphia; the National Warm Air Heating and Ventilating Association's representative is A. M. Daniels, of Washington, D. C.; and the Bureau of Mines Experiment Station's representative is William P. Yant.

The complete report takes up in detail such matters as heights, areas, walls, floors, roofs, columns and girders, partitions, parapets, wall openings, protection of vertical openings, ramps, exterior attachments, bus entrance or exit doors, lighting and power, heating, ventilation, fuel-burning appliances, storage and handling of flammable or corrosive liquids and protection in the way of automatic sprinklers and other appliances.

Following are the sections referring to heating and ventilation; they are presented at this time merely for comment and criticism:

Section 15. Heating.

The heating of all types of garages, and adjacent buildings occupied by any department thereof, shall be done by means of either of the following methods:

(a) Steam or hot water, either direct or indirect system.

(b) Any type of warm or hot-air system in which the air is not passed over a surface heated to the point of glowing or incandescence.

NOTE. *It is also the intent of the committee to permit unit heaters of acceptable type. A later amendment of this section will provide more detailed requirements for these and also systems of the warm and hot-air type.*

All boilers, furnaces, or other heat-generating plants must be installed in a fire-resistive room, having no openings in walls between this and adjacent rooms. The entrance to the boiler or furnace-room to be direct from outdoors. All air entering boilers and furnaces to be drawn direct from outdoors.

Sufficient heat shall be supplied to permit operation of the ventilating system at all times.

For additional specifications governing the installation of indirect heating systems, and of hot-air furnace system, see paragraph under "Ventilation."

Section 16. Ventilation.

This specification pertains to any automobile bus, or automobile taxie garage, housing more than five cars.

A. CAR STORAGE ROOMS.

(a-1) A system of natural ventilation without mechanical means of circulating air will be permitted, only where it is possible to maintain open windows at all times, and uniformly distributed in two opposite outside walls. Total area of open windows in all walls to be at least 5% of floor area.

(a-2) Where it is impractical to operate a system of natural ventilation continuously, as described in paragraph a-1, it will be necessary to operate a mechanical system for supplying fresh air to the room. This system may be combined with the heating installation in the form of an indirect heating system, or the two may be entirely separate installations. This system shall supply at least 2 cu. ft. of air per minute for each square foot of floor area. This air shall be introduced uniformly into the occupied area through openings spaced not over 75 feet apart, and not less than 6 feet above floor—the incoming air to be directed horizontally in all directions. Recirculation of air through the ventilating system is prohibited.

(a-3) Where it is impracticable to operate a system of natural ventilation, as described in paragraph a-1, a mechanical system will be required for removing the foul air, gases, etc. This system will consist of vent openings placed not over 50 feet apart, and within 24 in. of the floor. These openings shall be connected, either direct, or by means of incombustible ducts or flues, to one or more spark-proof exhaust fans capable of drawing through the system and delivering to the atmosphere the volume of air specified in paragraph a-2. All discharge outlets shall be covered with 20 in. x 20 in. mesh brass screens. The vent openings should be carefully located to avoid short circuiting the fresh air supply before it has been completely distributed through the room.

B. CAR REPAIR ROOM.

(b-1) Repair rooms in which internal combustion motors are operated under power, while stationary, shall have fresh air supplied by means of a system of mechanical ventilation as specified in paragraph a-2.

(b-2) Repair rooms in which internal combustion motors are operated under power, while stationary, shall have the exhaust gases removed. This may be accomplished by either of two methods described below:

First. Gravity Method. If this method is used, the motor will discharge direct to outdoors through a straight duct or pipe of incombustible material, and of suitable size, installed as an extension of the exhaust pipe or muffler; the extension in no case to exceed 15 ft.

Second. Forced Ventilation Method. By this method the exhaust gases shall be removed by means of one or more spark-proof exhaust fans, having their inlets connected to a duct system constructed of incombustible material.

Beneath each car, in which a motor is operated, shall be located an air intake opening connecting into the duct system. Each intake opening shall have at least 1 sq. ft. free area. A deflector hose, or flexible tube, of incombustible material shall be used to direct the exhaust gases from each motor exhaust pipe into the corresponding air-intake opening to the duct system. The exhaust fans shall be capable of drawing through the above described duct system, and discharging to the atmosphere, outdoors, not less than 1,000 cu. ft. of air per minute from beneath each car in which a motor is operated. All discharge outlets shall be covered with 20 in. x 20 in. mesh brass screens.

(b-3) Repair rooms in which internal combustion motors are not operated under power, except when cars are in transit, shall be ventilated similarly to Car Storage Rooms, described in Section 16 A, paragraphs (a-1, a-2 and a-3).

Section 17. Fuel-Burning Appliances.

Steam generators for tire vulcanizing, for oil and grease removal and for purposes other than space heating, water heaters and other fuel-burning appliances, such as forges, shall not be installed within bus-operating section or within carpenter or paint shop.

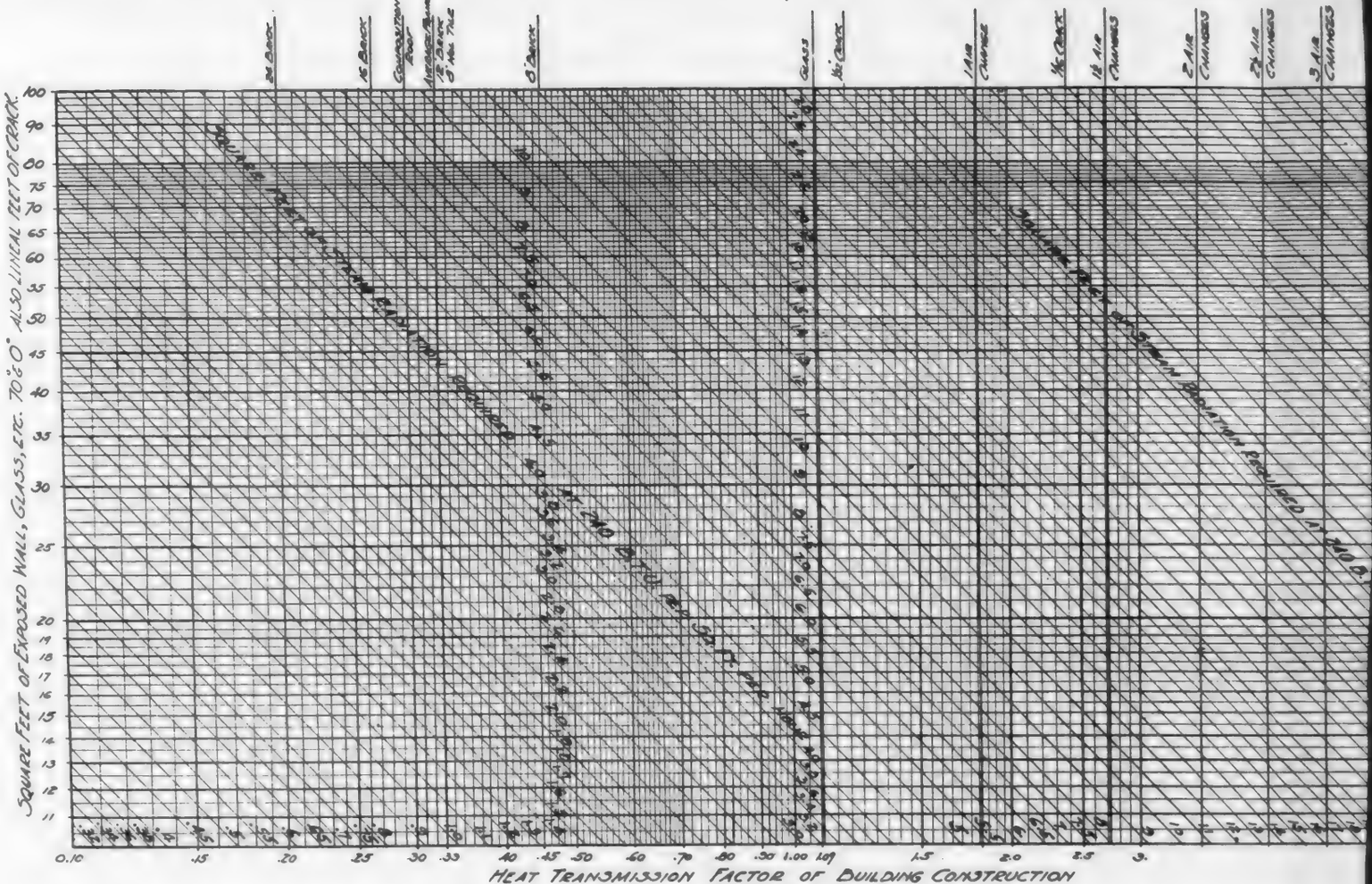
N. F. P. A. Amending Blower Systems Code

Advance publication is announced by the National Fire Protection Association of the report of the Committee on Blower Systems, containing proposed amendments to the regulations for the installation of blower and exhaust systems. The report was scheduled to receive consideration at the annual meeting of the N.F.P.A. in Chicago, May 9-12. The revisions are primarily for the purpose of clarifying the intent of certain sections of the rules which have been misunderstood in field application. The requirements for the materials of construction of fans are revised to modify the rule calling for all-bronze construction in certain cases, which has proven unnecessary.

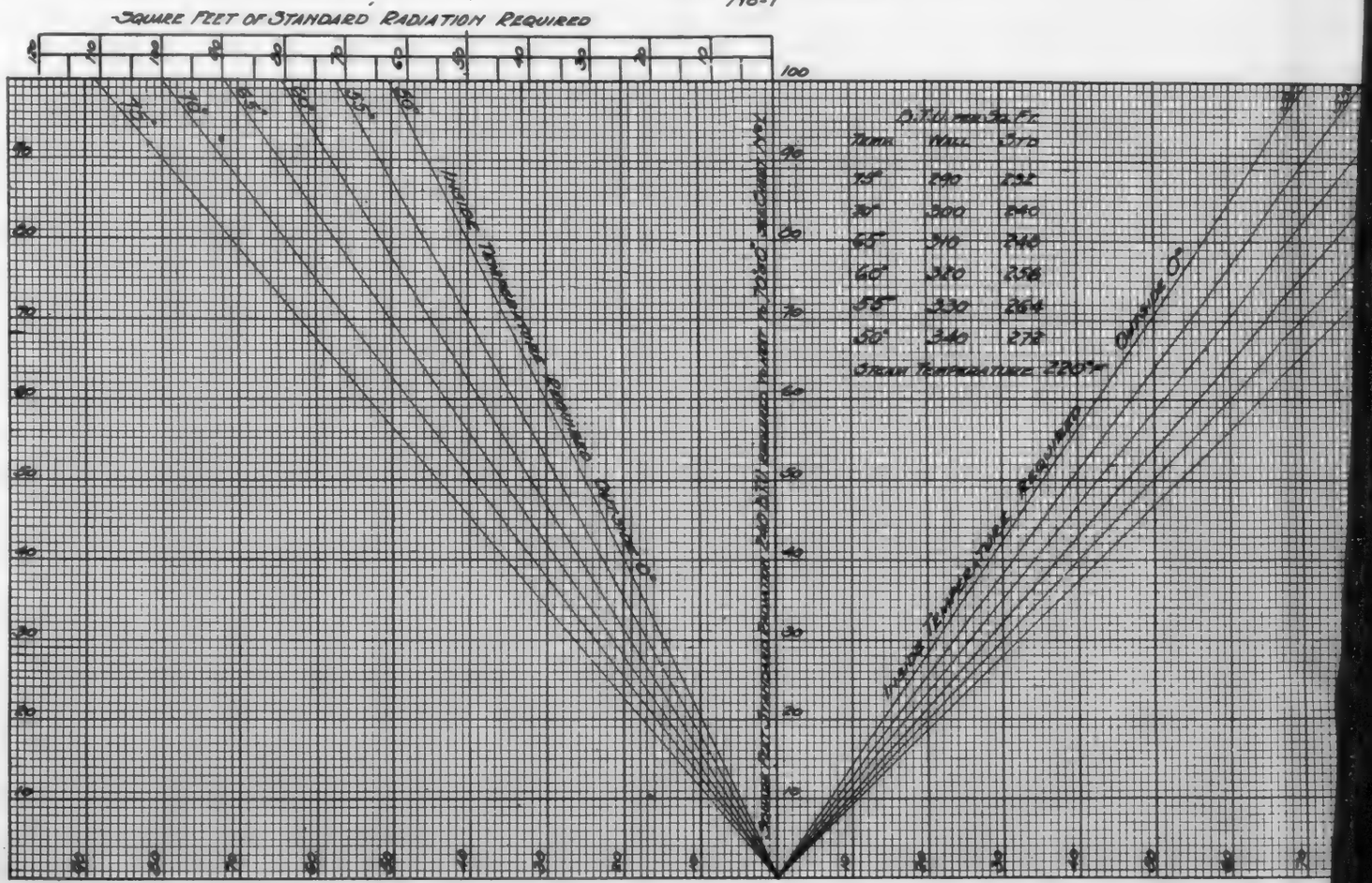
Half a Million Dollars for Fire Prevention

The National Fire Protection Association has launched a campaign to raise half a million dollars for fire-prevention work. The annual loss by fire of 15,000 lives and $550,000,000 in property shows the need for such effort. In Europe the annual loss is only one-tenth of what it is in the United States.

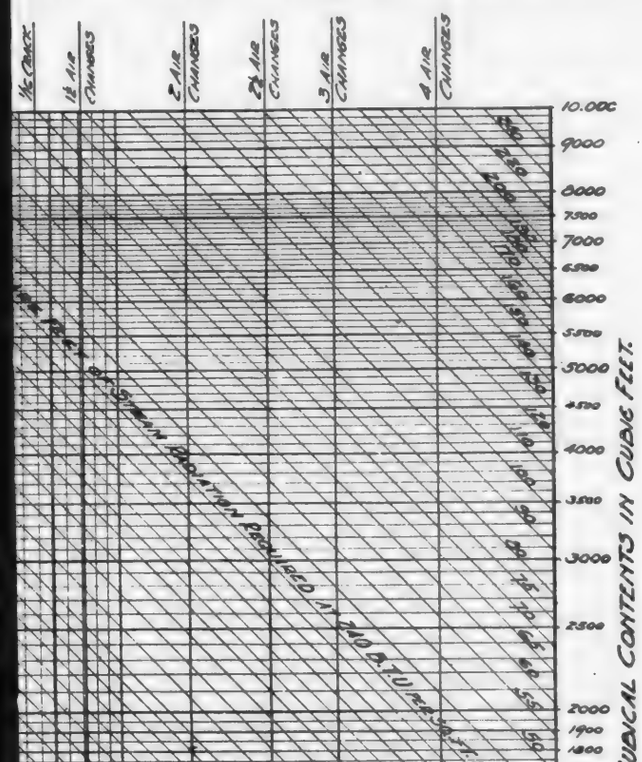
The association has had two field men engaged in the organization of local fire prevention committees, and has demonstrated that reductions in fire losses result from such work. It is expected that ten men will be placed in the field as soon as the necessary funds are raised to finance this broadened effort.

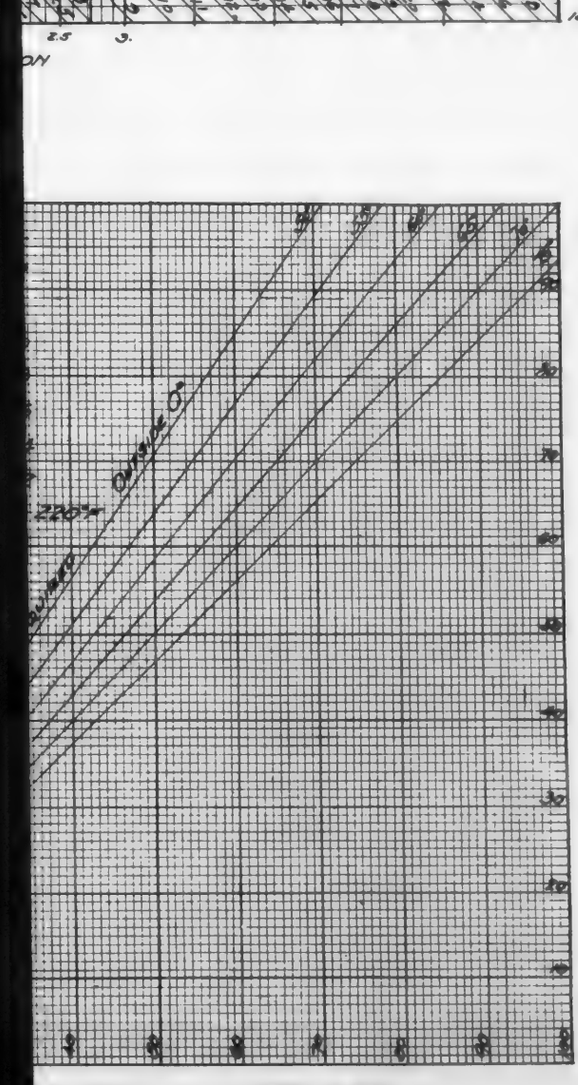

SQUARE FEET OF EXPOSED WALL, GLASS, ETC. TO 0° ALSO LINEAL FEET OF CRACK.
SQUARE FEET OF STEAM RADIATION REQUIRED AT 240 B.T.U.
SQUARE FEET OF STEAM RADIATION REQUIRED AT 240 B.T.U.
HEAT TRANSMISSION FACTOR OF BUILDING CONSTRUCTION

RADIATION CHART.
No-1



RADIATION CHART
No 2





X - STANDARD AT 240 B.T.U.

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RADIATION COMPUTING

Directions for Using Estimating Charts

ring to Chart No. 1, assume, for example, 90 sq. ft. of exposed 8-in. all and 32 sq. ft. of window having 22 lin. ft. of crack. Standard ns, i.e., room temperature 70° F., outside temperature 0° F., steam ture 220° F.

from 90 at left-hand side of chart. Follow to right on horizontal intersection with line extending down from "8-in. brick" at top of and note nearest diagonal line 12, this being the square feet of g surface required on account of wall exposure. Then, as before, read to right to line from "Glass" and nearest diagonal line gives t. as the required surface. Similarly, 22 lin. ft. of 1/32-in. crack require 8 sq. ft. of radiation. Adding each amount, the total radia- quired is found to be 30 sq. ft. when using direct 2-col. radiation B.T.U. transmission per square foot.

kind of construction whose coefficient of heat loss is known can ed on the chart by selecting the proper coefficient from those noted he bottom of the chart. It should be pointed out also that "air " instead of "infiltration" can also be figured, if preferred, simply ing from "cubic feet," at right-hand side of chart, to left to inter- with the line extending down from the number of air changes de- pon.

ring to Chart No. 2, 30 sq. ft. of column radiation, as established would require only about 24 sq. ft. if wall radiation were used. read from 30 on center line, left to intersection with 70° room- ature line, thence down to 24 at bottom of chart. This also may ulated, or proven, thus,

$$\frac{30 \times 240 \text{ B.T.U.}}{300 \text{ B.T.U. (See Table)}} = 24.$$

ation required for various other room temperatures, as noted, also e read from the chart. Thus, read from center line at 30, left to gonal line, thence up to top of chart and 19 sq. ft. is found as the t of direct-column radiation required in a room at 50° F. tempera-

nd the load this amount imposes on the boiler in equivalent direct on for standard conditions of 240 B.T.U. transmission and 70° F. emperature, go back to 30 on center line, read right to 50° room- ature line, thence down to bottom of chart and read 21. This is iler tax," or the amount of direct-column radiation under standard ons equivalent to the heat effect of 19 sq. ft. of such surface when om heated to only 50° F. It should be noted that the "boiler tax," d is really only the amount of equivalent direct radiation required. not include any allowance for piping, factor of safety, or quick load.

T. W. Reynolds.

Correspondence

Conducted by T. W. Reynolds

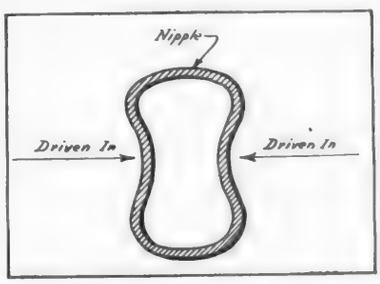
Easy Repair of a Difficult Boiler Job

EDITOR HEATING AND VENTILATING MAGAZINE:

I would appreciate very much your advice as to how to repair a cracked section of a header type of heater in a water heating system. The crack cannot be plugged because it is not sufficiently accessible for that purpose. I might add that the headers to the boiler are so rusted that it will be quite a job to remove the cracked section.

N. R. L.

The best way to repair this job, under the given conditions, would be, first, to



Method of Collapsing Nipple for Easy Removal From Header-Type Boiler

empty the system, and then pack mineral wool or lead rope in the crack, over which apply Smooth-On, then leave as finished for two or three days of drying. If the repair looks satisfactory at the end of this time, fill the heater to the top and put in a few quarts of "X" liquid. The heater should then be run with a fire for a few days in order to circulate the liquid.

Eventually the liquid will enter the crack where it will oxidize on the outside as soon as it makes contact with the air. If the crack appears tight, fill the system up to the expansion tank. The liquid may then be left in for the purpose of making tight joints throughout the piping system.

The method as described should easily remedy the trouble, and, for that matter, it may be that either the Smooth-On or the liquid would be sufficient in itself without the other, much depending upon the size and nature of the crack.

It will not be necessary to remove the cracked section, but should it ever be, with this or some other heater, it can be easily done by first cutting the nipple off with a hack saw. The remaining portion of the nipple then can be forced out by causing it to collapse when driven in on each side, as shown in the sketch.

Various other methods of stopping leaks in boilers have all been tried in times past with more or less success, such as rust-joint preparations, iodine, water-glass, bran, oatmeal, potatoes, and numerous other floating non-metallic preparations. As a general rule, however, these substances act merely by temporarily plugging up small openings through which the water eventually escapes. Aside from this, such materials may produce odors and may possibly be the cause of priming and foaming, or they may adhere to and insulate the metal against heat transfer, as well as form acids which promote corrosion.

A Home-Run Water Heating System

EDITOR HEATING AND VENTILATING MAGAZINE:

I am a steamfitter, living in a city where three-story tenements are often built with each tenement having its individual gravity water heating system and coal shed, the second and third stories with "Home Run" down-feed systems and the first story with an upfeed system. Each system is entirely separate from the other, with the exception that only one flue is built for the three heaters.

In connection with this system, will you kindly tell me just where to use the different kinds of branch connections, as shown in the accompanying sketch; also, whether it is necessary to use a separate return connected direct to the heater where the flow branch connection is within 8 ft. of the heater?

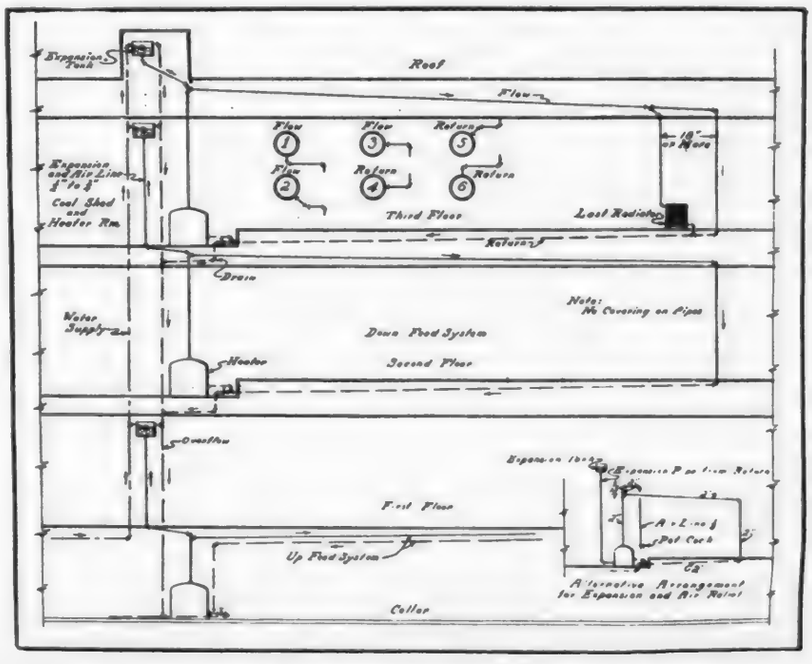
We call this system "Home Run" because the flow main, instead of ending at the last radiator, as is usually done, is extended 18 to 24 in. farther, then dropped and connected to the return; in other words, without stopping at any point the water makes a complete circuit back to the point of starting through mains which are of the same size throughout.

J. ARMAND LE FRANCOIS.

Montreal, Canda.

In general, for downfeed systems having short runs, such as shown, and where the boiler is located on the same level as the radiators, all drop risers would be fed with the tee in the same position (No. 3). This form of connection requires the use of a minimum number of fittings, hence gives least resistance to flow in an installation, such as this, where the motive head for circulation even at its best is but slight.

Of course, judgment according to the conditions of each case is required on these matters, not following any particular rule which never varies. Connections should be varied slightly if required; in some cases where thought necessary to retard the flow to the nearest radiators, using connection No. 1 or 2 on the flow, with or without corresponding restrictive connection on the return, such as Nos. 6 and 5. For example, No. 2 would be used for any connection very close to the heater, especially where the distance to the end of the system is so great that the hottest water tends to short-circuit and take the path of least resistance through the nearest connection back to the heater.



Correspondent's Sketch at Home-Run Water Heating System

No. 1 can be substituted for No. 2 where greater restriction to flow at this point is required, the greater resistance being obtained due to the substitution of one 90 deg. fitting in place of the 45 deg. fitting. The tendency to short circuit at this point is further limited, because of this form of connection taking the colder water from the bottom of the flow main.

Separate returns are used mainly in upfeed systems where the nearer risers and first floor radiators receive the hotter water, hence, circulating more rapidly, discharge hotter water into the return main and therefore, slow up the circulation to first floor radiators farther along the main, particularly as the latter radiators have but little motive head for circulation, due to their slight elevation above the heater. In the case submitted, all radiators of a single system are on the same floor level, so that the effect of different elevations do not exist; the only tendency for differences in circulation being that due to greater or less distance from the heater, which differences are not so marked in systems having short runs.

The so-called "Home Run" feature of this system is interesting, though its practical value is debatable. Evidently, the idea is to obtain quick circulation in starting up, similar to that obtained by means of a starting pipe, as often used in sluggish systems, i.e., a pipe connecting flow and return at the heater. Of course, there is less water in the mains to heat than in the entire system and less resistance to flow than through all of the radiators. On the other hand, getting the water hot throughout the mains does not necessarily mean that it will get hot in the radiators. The water might find less resistance to flow through the nearest radiators than through the mains. Conditions in the system when starting up and after thoroughly hot throughout are different, hence, a stop valve should be placed in the drop connecting flow and return mains.

The use of a reversed return would be of considerable help in placing each radiator on equal circulation basis. Another thing that could be done, would be to extend each flow main up to the attic of the top floor, vent each there to its respective tank, then drop each with uncovered main to its horizontal distributing main. The cooling in the drop would be of material help to the circulation.

In reference to the alternative arrangement as shown in the sketch, it will be noted that this method depends upon manual control for freeing the system of air. A tenant is quite apt to neglect his system in this respect, and then when it becomes air bound, will criticise the system for its failure to function properly.

It should also be noted that the upper heater has very little chimney effect for purposes of draft. Furthermore, each heater should have its own flue, as the air pulled through the heater above tends to kill the draft through the heater below. Most certainly the entire arrangement of the system submitted needs favoring in every respect in order to obtain positive results, notwithstanding which fact the system has been handicapped with the above. Without doubt, difficulties ensue in the operation of these systems due to the fact that one fire may be banked, while some other fire is operating at a high rate of combustion. The thickness of the different fuel beds and tightness of the dampers will also vary. Because of this, the draft requirements will be different for each heater and any particular heater will be more or less of a hindrance to all other heaters.

Points On Galvanizing Pipe

EDITOR HEATING AND VENTILATING MAGAZINE:

What is double galvanizing? Why should covered pipe or cast-iron fittings be galvanized? Can pipe be galvanized only on one side, that is, on whichever side is required?

E. O. R.

Double galvanizing seems to be a term bandied about, yet with no foundation in fact. It is impossible by the usual hot process of dipping to obtain more than one weight of galvanizing, although in the electrolytic process the amount of galvanizing deposited upon the pipe is in direct proportion to the time the pipe is left in the bath.

Inasmuch as the pipe is dipped into the galvanizing bath, it is hardly practical to so protect it that only the inside or outside would be galvanized as desired. In fact it would cost more to do this than to galvanize it all over. This galvanizing is done before the pipe is threaded, the threads being left somewhat cleaner. A close nipple would be all threads, therefore it is only galvanized on the inside.

Painting on galvanized pipe is not needed as much as it is on black pipe, but it does add an additional protective coating, and, of course, where the pipe is covered, neither galvanizing nor painting is as desirable as where the pipe is left uncovered. However, the galvanizing and painting are usually done irrespective of the covering or of one another, in order to eliminate the bad effects of sweating or condensation, if any. There is the further possibility that the covering may become loose in time and work off, or else it may get wet due to leaks at threads or other conditions. There is also the necessity for prevention of interior corrosion with consequent discoloration from rusty drips.

Generally speaking, the extra life given to the pipe by the galvanizing more than justifies the higher cost of such pipe, especially when the pipe is laid underground* or in other inaccessible places. This is particularly true when the cost of new fittings and covering is taken into account, as new fittings are usually required whenever the joints are remade with new pipe.

Cast-iron fittings, even when flanged, are sometimes galvanized for appearance sake, especially when used with galvanized pipe. Aside from this, cast-iron fittings are galvanized whenever used on piping in which rust or discoloration from rusty drip would be objectionable.

*In such cases the pipe is frequently made "extra strong" instead of standard weight.

Another Garage Heating Problem

EDITOR HEATING AND VENTILATING MAGAZINE:

Referring to the matter of garage heating, as discussed in THE HEATING

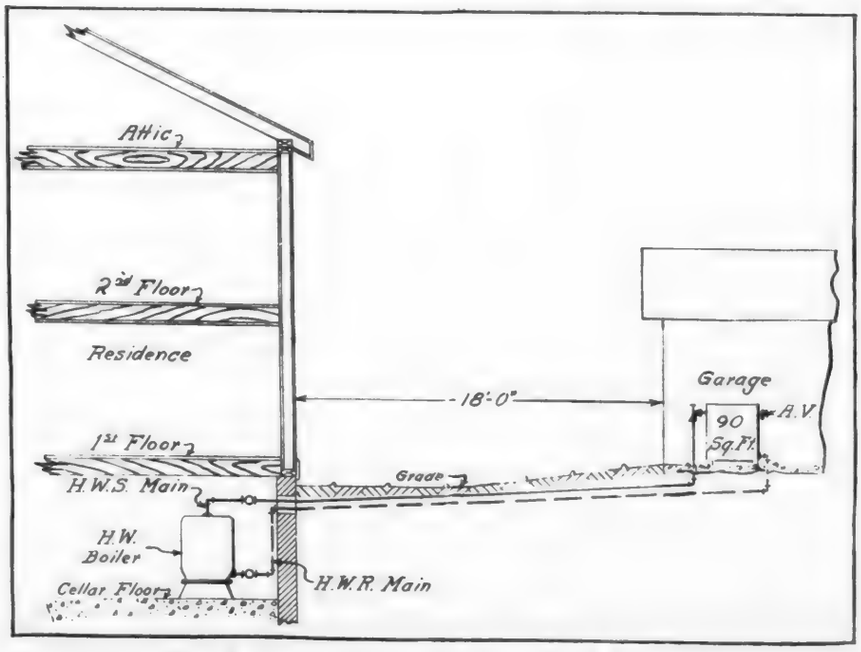


Fig. 1. Original Layout of House and Garage

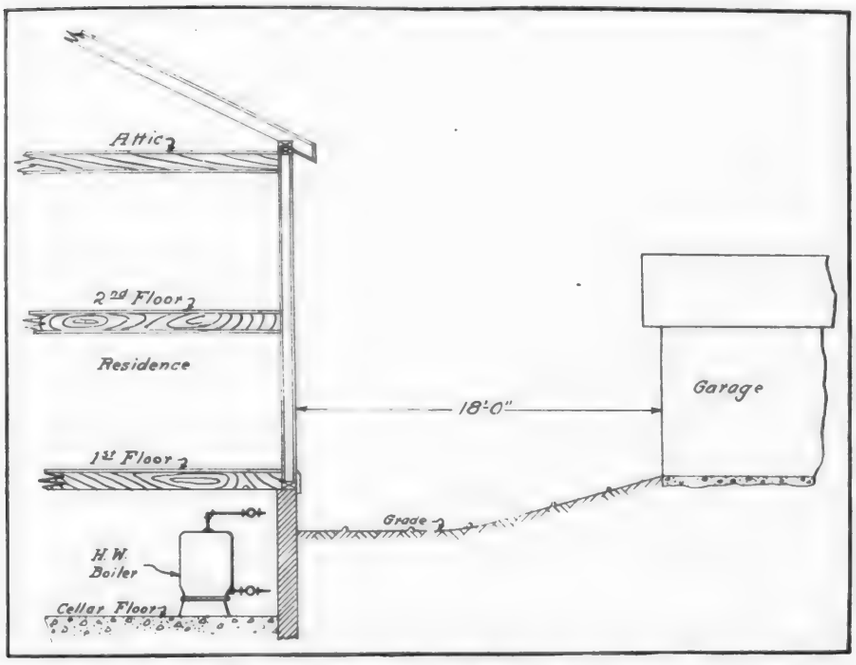


Fig. 2. Final Condition of Ground Between House and Garage

AND VENTILATING MAGAZINE for February (P. 102), I would like to state that I have a similar problem, except that hot water is used for heating instead of steam.

The radiator in the garage is 90 sq. ft., and, when the estimate was made, the architect had the house and garage arranged as shown in Fig. 1. Owing to a desire to save money, it was decided later to omit some of the grading and filling work and the job was left as shown in Fig. 2.

Will you please tell me how this garage could be heated with a water heating system, and under the conditions illustrated in Fig. 2?

WILLIAM NYGREN.

Bridgeport, Conn.

Our correspondent has a problem which is much easier to solve with a water heating system than with a steam system. In a steam system the steam pipe must be kept above the boiler waterline in order to get drainage, but in a water system there is no boiler waterline to be considered. It is only necessary to provide sufficient motive power to cause circulation through the garage radiator and the whole matter is solved.

The motive power in gravity water circulation is provided by the difference in weight between the column of supply water and the column of return water, this difference being caused by the higher temperature in the supply column expanding the water to a greater degree than in the relatively cooler return column. Unless this difference in temperature, with the resulting difference in weight, is maintained, no circulation will be set up.

Now in the case of the garage, to produce a good circulating line, it is only necessary to carry the garage supply pipe up to the top of the house and vent it over the expansion tank, then carry it back down to the cellar and to a point low enough to grade up from the cellar to the garage radiator. The return is run straight from the garage radiator back to the boiler — sloping down towards the boiler—and at the boiler is connected into the boiler return, which comes back from the house. (See Fig. 3.)

The height to which the supply is carried has a great deal to do with the amount of circulation received and, for this reason, the higher the supply pipe is carried, the better the results will be. The hottest—and, therefore, the lightest —water is contained in the riser going up from the boiler. Consequently, this water has a tendency to rise when compared to the water in the drop going back to the cellar, due to the fact of the water constantly losing heat through radiation from the pipe line, and cooling off as it progresses around the circuit. The reduction in temperature is sufficient to cause a difference in weight, which is adequate to circulate the water over to the garage and back.

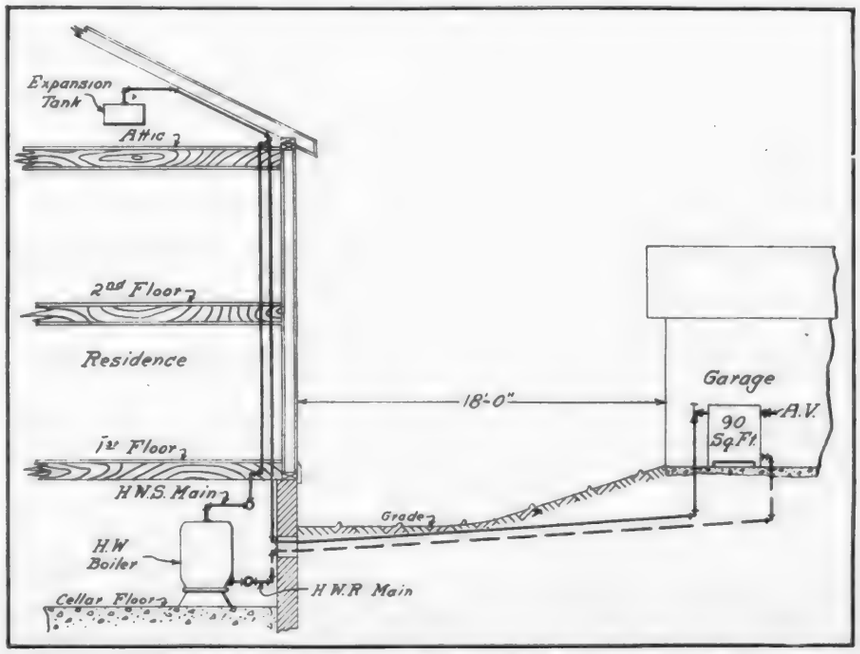


Fig. 3. Solution of Garage Heating Problem with Grade Below Top of Boiler

Advantages of Intermittent Heating

EDITOR HEATING AND VENTILATING MAGAZINE:

What are the advantages of intermittent heating?

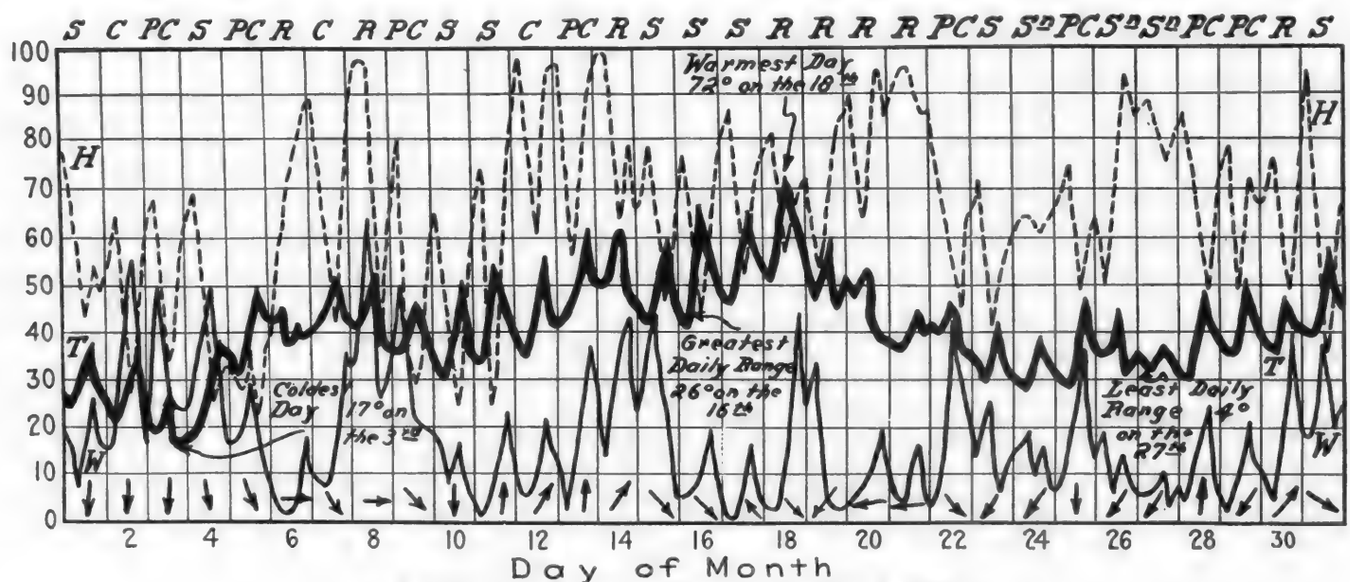
P. E. G.

Intermittent heating lessens the heat loss due to the lower average temperature difference. The successful application of this method depends upon the rapidity with which heat may be supplied whenever it is necesary to raise the temperature to normal again. Where there is an excess of radiation this easily may be done, but it readily can be accomplished in nearly any installation, inasmuch as the amount of radiation in most heating systems is purposely made sufficient for satisfactory heating in zero weather. For example, the average winter temperature is around 35° F. in the vicinity of New York, hence there is an average excess of radiation of about 100%.

The disadvantage of intermittent heating is the danger from freezing at points where condensation can collect and be retained. Such places are quite apt to exist in traps, wet returns, false water lines, pockets under doors, scale pockets, and the low points of sections in radiators. From this it will be seen that water heating systems are not alone in their liability to freezing.

The Weather for March, 1927

	New York	Boston	Pittsburgh	Chicago	St. Louis
Highest temperature, deg. F	72	69	74	71	75
Date of highest temperature	18	14	13	16	16
Lowest temperature, deg. F	17	16	19	24	22
Date of lowest temperature	3	3	3	4	2
Greatest daily range, deg. F	26	29	34	28	28
Date of greatest daily range	16	11	16	10	15
Least daily range, deg. F	4	5	4	3	2
Date of least daily range	27	6	22	21	21
Mean temperature for month, deg. F	42.6	41.6	44.8	42.0	47.9
Normal mean temp. for month, deg. F	37.7	35.6	39.6	35.3	44.2
Total precipitation, in	1.18	1.19	3.20	2.69	7.67
Normal precipitation, this month, in	4.10	4.08	3.01	2.55	3.43
Total snowfall, in	0.2	0.6	Trace	0.4	3.0
Total wind movement for month, miles	11596	7727	8859	9348	10370
Average wind velocity, miles per hour	15.6	10.4	11.9	12.6	13.9
Prevailing direction of wind	N. W.	W.	W.	S.	S.
Number of clear days	9	13	4	9	9
Number of partly cloudy days	10	12	7	6	7
Number of cloudy days	12	6	20	16	15
Number of days with precipitation	12	7	13	12	12
Number of days with snow	2	2	1	1	1
Snow on ground at end of month, in	None	None	None	None	None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Warmest Day 72° on the 18th
Greatest Daily Range 26° on the 16th
Coldest Day 17° on the 3rd
Least Daily Range 4° on the 27th
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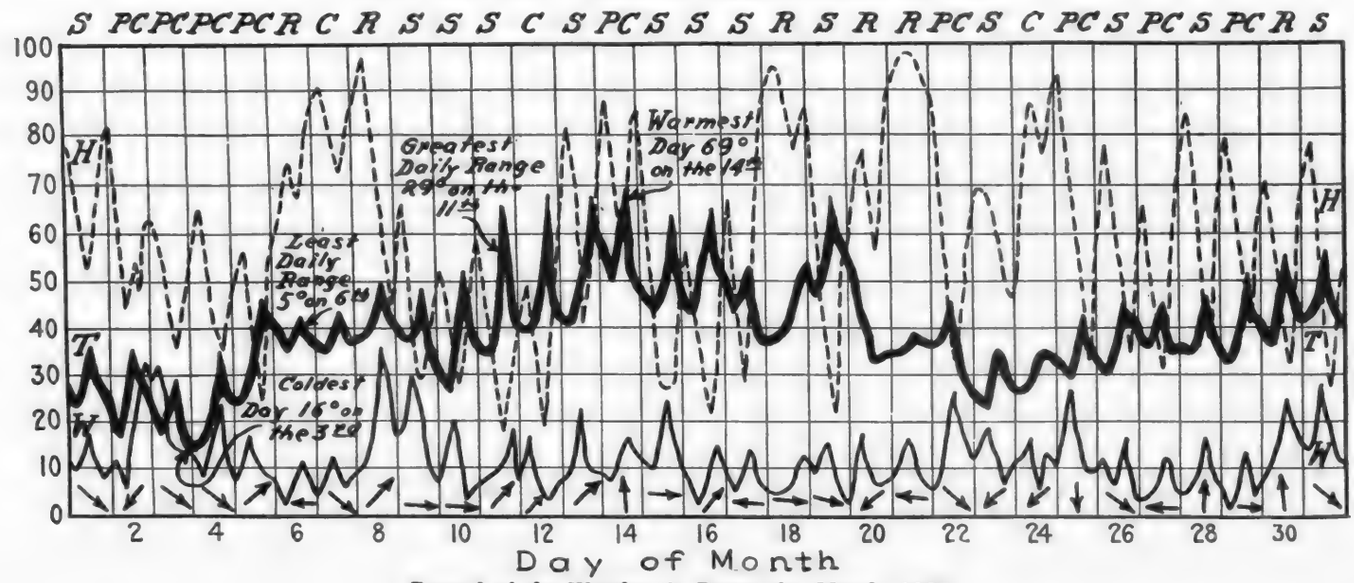
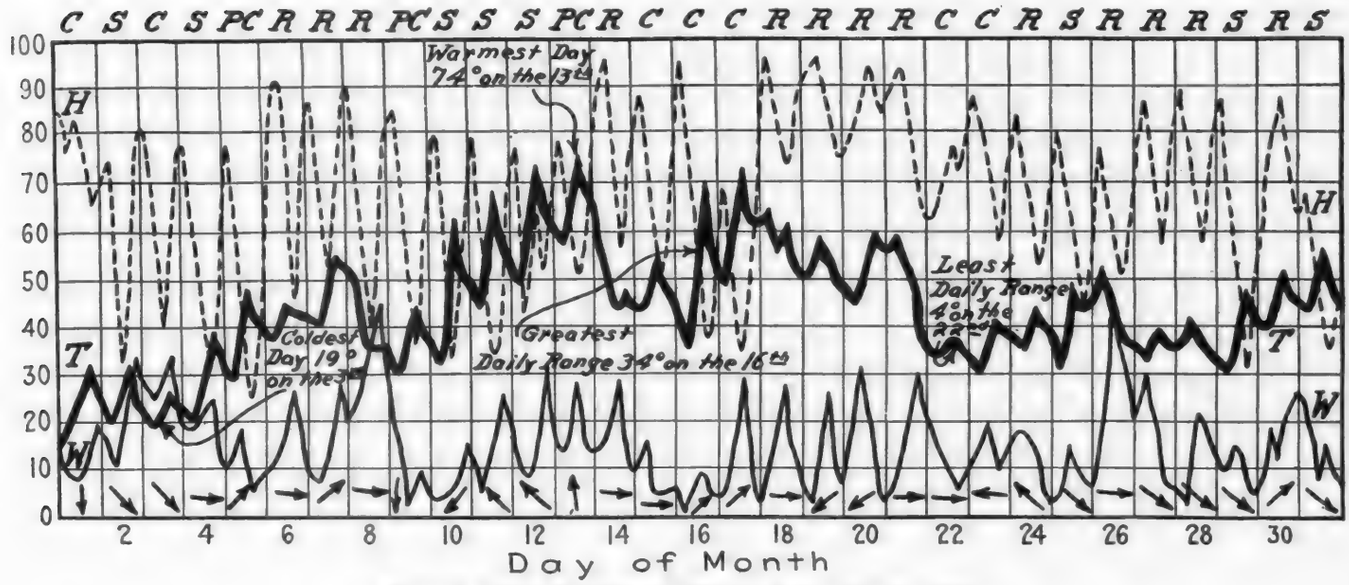
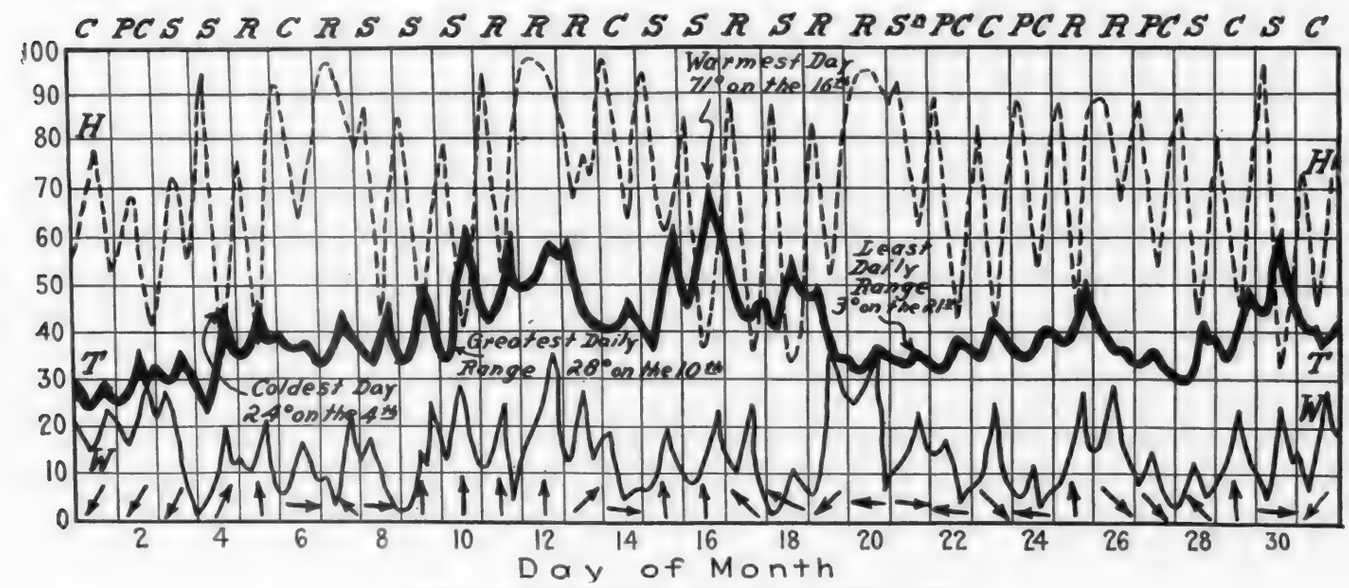
Record of the Weather in New York for March, 1927
(Hourly Observations of the Relative Humidity Plotted on this Chart)


S PC PC PC PC R C R S S S C S PC S S S R S R R PC S C PC S PC S PC R S
Greatest Daily Range 29° on the 11th
Warmest Day 69° on the 14th
Least Daily Range 5° on 6th
Coldest Day 16° on the 3rd
H
T
W
Day of Month

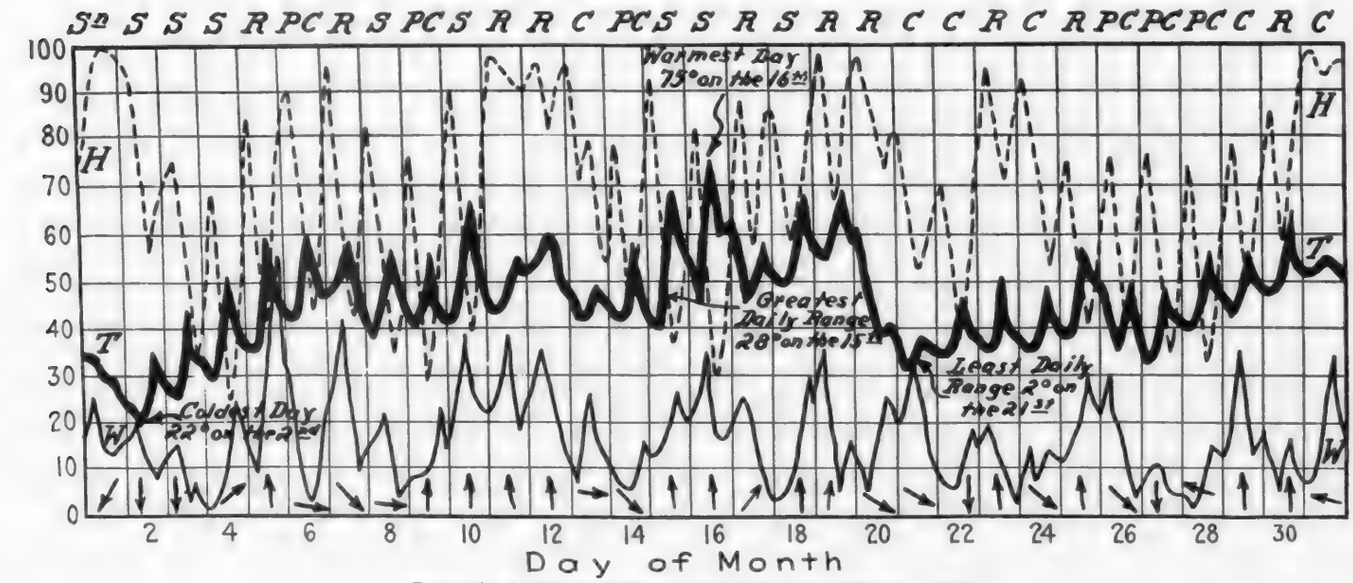
Record of the Weather in Boston for March, 1927


C S C S PC R R R PC S S S PC R C C C R R R R C C R S R R R S R S
Warmest Day 74° on the 13th
Coldest Day 19° on the 3rd
Greatest Daily Range 34° on the 16th
Least Daily Range 4° on the 22nd
H
T
W
Day of Month

Record of the Weather in Pittsburgh for March, 1927


C PC S S R C R S S S R R R C S S R S R R S PC C PC R R PC S C S C
Warmest Day 71° on the 16th
Coldest Day 24° on the 4th
Greatest Daily Range 28° on the 10th
Least Daily Range 3° on the 21st
H
T
W
Day of Month

Record of the Weather in Chicago for March, 1927


Sn S S S R PC R S PC S R R C PC S S R S R R C C R C R PC PC PC C R C
Warmest Day 75° on the 16th
Coldest Day 22° on the 2nd
Greatest Daily Range 28° on the 15th
Least Daily Range 2° on the 21st
H
T
W
Day of Month

Record of the Weather in St. Louis for March, 1927

Plotted from records especially compiled for THE HEATING AND VENTILATING MAGAZINE by the United States Weather Bureau.
Heavy lines indicate temperatures in degrees F. Light lines indicate wind in miles per hour.
Broken lines indicate humidity in percentage from readings at 8 A.M., 12 M., and 8 P. M.
S—Clear, PC—partly cloudy, C—Cloudy, R—rain, Sn—snow. Arrows fly with prevailing directions of wind.

National Warm-Air Heating and Ventilating Association

Furnace Industry Preparing to "Cash In" on Its Research Work

BASED upon its investment of time and money in research, the National Warm-Air Heating and Ventilating Association, at its annual convention in Cleveland, O., April 13-14, announced that the furnace industry is now ready to enter a period of achievement. The question facing furnace men, it was declared, is how they are going to use, first, the facts which have been developed in the association's research laboratory; second, the plans of the joint code committee and, third, the activities of the educational publicity bureau.

As was brought out by President E. B. Langenberg, in his address, the association has accomplished most of its major objectives in connection with its present research program, and he listed them as (1) the establishment of a connection with the Research Laboratory at the University of Illinois, (2) the establishment of the Joint Code Committee, (3) the construction of the association's Research Residence, (4) the establishment of the educational publicity program, (5) the creation of associate memberships to broaden the scope of the association's work, and (6) the establishment of a rating formula on warm-air furnaces.

"In other words," he said, "we have analyzed our product; we have built an efficient organization in which each individual has his share of work; we have looked to production and have standardized installation, and our advertising policy has shaped itself with an eye to the future."

It now remains to solve the sales problem, or, as he expressed it, "at this meeting our sales policy is to be worked out and our plans for the future put in tangible form so as to secure, without doubt, the universal adoption of warm-air heating in the home."

WORK OF EDUCATIONAL PUBLICITY COMMITTEE

President Langenberg had some interesting things to say regarding the work of the Educational Publicity Committee. "This committee," he pointed out, "is but two years old, but it has to do with one of the largest financial undertakings that this association has ever entered into," and he told how the committee has supplied speakers for meetings, has brought to the attention of the public the story of the association's research work, has originated new sales ideas, and has sent its messages to the installer.

"As near as I can figure," stated Mr. Langenberg, "the members of this organization have, during the past 13 years, invested, in round numbers, in this association work, about $500,000, and for this sum we have received fundamental knowledge on warm-air heating, a standard rule for installation, and an educational publicity campaign which is commencing to show results.

"I have no hesitation in saying," he added, "that within another five years the returns on our investment should be far in excess of the sum invested."

SALES POSSIBILITIES BEFORE INDUSTRY

Among the interesting data presented by L. Wayne Arny, director of public relations, were some government statistics to the effect that there is a replacement market for warm-air furnaces at the present time of 250 per 10,000 population; 40% of these homes are heated from a central heating plant and of these 65% are warm-air jobs. Therefore, he figured, there is a potential annual replacement market of 650,000 warm-air furnaces, but there are only 500,000 furnaces being manufactured annually. "If that is not opportunity with capital letters," declared Mr. Arny, "then what is it?"

Secretary Allen W. Williams reported an increase of 93 associate members, making the present number 152. Six active or manufacturing members have been secured during the year. His report went at length into the activities of the association, including research, standard code, chimneys and chimney flues, and garage heating.

Professor J. D. Hoffman, chairman of the Joint Code Committee, discussed the need for minor changes in the code, and a motion was passed at the meeting providing for the publication of a fourth edition of the code in the form of a model ordinance. As a result the code will now be known as a "Uniform Standard Code Ordinance Issued by the National Warm-Air Heating and Ventilating Association."

Most of the research session, on the second day of the convention, was devoted to the data contained in a forthcoming bulletin of the University of Illinois, listed as Circular No. 15. As discussed by Professors V. S. Day and A. P. Kratz, of the University of Illinois, the circular deals with the performance of the warm-air heating installation in the Research Residence at Urbana during one period of zero weather. At the time these tests were made, the installation had three cold-air returns.

The new officers are: President, Charles E. Hall; vice-president, Charles Seelbach; treasurer, W. P. Cooke; secretary, Allen W. Williams; executive committee: I. L. Jones, chairman; E. B. Langenberg, R. C. Cook, H. T. Richardson, C. E. Glessner and C. A. Olson.

Over 350 producers, installers and salesmen were present. The association's mid-year meeting, it was announced, will be held at Urbana, and the next annual meeting in Chicago.

Meeting of British Heating Engineers

A paper by Dr. Margaret Fishenden on "The Effect of Weather Conditions Upon the Heat Requirements of a House," was a feature of the ordinary meeting of the Institution of Heating and Ventilating Engineers, held in London, February 9.

One of the reports presented at the meeting showed that there were 389 members, 159 associate members, and 20 graduates. For the Technical Education Committee, Walter Yates, chairman, referred to the provision which had been made for the formation of a junior section of associate members and graduates, and he urged the members to promote this section, not only as a good thing for the younger members, but as providing prospective members for the institution ten or fifteen years hence.

For the Fan Standardization Committee, Mr. Yates reported that the committee's work was now completed. In the report many of the terms hitherto used have been discarded because of their unsuitability. New terms have been introduced which, it is hoped, will become standardized. The method of testing fans laid down, it is believed, will give results satisfactory alike to manufacturers and users. According to the method of listing fans in catalogs, together with the prescribed characteristic performance curves, the new method proposed will enable manufacturers to show exactly what their products will do under definitely-stated conditions.

A reason for the delay in the completion of the report was explained by E. Ower to the effect that one or two points were discovered, only after the report was ready for presentation, which might result in errors as great as 30% on the volume measured. The point, he said, occurred in the measurement of resistance. As some extenuation of the fact that it was not discovered sooner, Mr. Ower stated that the American Fan Standardization Committee of the A. S. H. & V. E., as well as the Germans' code for the testing of fans, both recommended the method which he maintained was wrong.

At the close of the meeting the new president, J. L. Musgrave, took the chair and presented his inaugural address.

National District Heating Association

Program Completed for Annual Convention

Details now available of the program as arranged for the eighteenth annual convention of the National District Heating Association, at the West Baden Springs Hotel, West Baden, Ind., May 17, 18, 19 and 20, indicate the wide scope of the association's activities. In the program as here given, it will be noted that after the first day, sessions will be held in the morning only, so that Wednesday, Thursday and Friday afternoons will be free for the elaborate entertainment features arranged by the entertainment committee, of which H. C. Kimbrough is chairman:

AFTERNOON SESSION, MAY 17

Address of President J. E. Seiter.
Report of secretary-treasurer.
Report of executive committee.
Report of membership committee, H. C. Kimbrough, chairman.
Report of educational committee, J. H. Walker, chairman.
Report of operating statistics committee, J. C. Butler, chairman.
Appointment of nominating committee.
Manufacturers' round table.

EVENING SESSION, MAY 17

Report of house heating research committee, F. B. Orr, chairman.
Address: "Combined Electric and Heating Plants Operated as Heating Stations, with Electricity as a By-product," by C. W. Morgan, general superintendent, Electric Department, Illinois Power Company.
Report of development committee, John W. Meyer, chairman.
Report of manufacturers' division, H. R. Wetherell, secretary.

MORNING SESSION, MAY 18

Report of nominating committee.
Report of station operating committee, I. E. Powell, chairman.
Address: "A Design for a New Underground Heating and Power Intercommunicating System for Purdue University," by Professor J. D. Hoffman, director, Department of Practical Mechanics, Purdue University.
Report of distribution committee, W. W. Stevenson, chairman.
"The Concentric Piping System of Steam Distribution," by J. E. Woodwell, consulting engineer, New York, and Claude R. Erickson, heating superintendent, Lansing, Mich.
"Economical Thickness of Insulation for Underground Distribution Systems," by R. H. Heilman, senior industrial fellow, Mellon Institute of Industrial Research, University of Pittsburgh.
Manufacturers' round table.

MORNING SESSION, MAY 19

Report of rates and regulations committee, by John W. Meyer, chairman.
Report of heat utilization committee, dealing with demand studies, L. S. Smith, chairman.
Report of meter committee, pertaining to demand meters, Charles H. Day, chairman.
Address: "Pending Climatic Conditions," by Herbert Janvrin Brown, Washington, D. C.
Manufacturers' round table.

MORNING SESSION, MAY 20

Report of hot water committee, R. C. March, chairman.
"An Experience with Orifice Method of Steam Distribution," by V. W. Hunter, Buel Land Company, Detroit, Mich.
Report of meters and accessories committee, Charles H. Day, chairman.
Election of officers.
Round table on small plant operation.

The association's annual banquet will be held Thursday evening, May 19, at the West Baden Springs Hotel, when an address will be delivered by Vice-President John F. Gilchrist, of the Commonwealth Edison Company, Chicago, followed by a lecture by Professor Charles M. Newcomb, of Cleveland, O., on "The Psychology of Laughter."

Heating Exhibit at the Architectural Exposition

Amid surroundings which equalled and even surpassed those previously established by the Architectural and Allied Arts Exposition, this year's show, held at the Grand Central Palace, February 23 to March 5, contained many exhibits of special interest to heating and ventilating men. One of the most interesting was that of the American Radiator Company, New York, which had on display, in an elaborately furnished booth, the new Recesso radiator of the concealed type which has recently been developed by the company.

Other exhibits were:

Metal Stamping Co., Long Island City, N. Y., fin-type radiation, radiator enclosures and heating units.

Armstrong Cork & Insulating Co., Pittsburgh, Pa., cork-board insulation.

Thatcher Co., Newark, N. J., heaters and furnaces.

Bryant Heater and Mfg. Co., Cleveland, Bryant gas boilers for heating service.

Electrozone Corp., New York, Electrozone equipment of the Air Conditioning and Engineering Co., St. Louis.

Celotex Co., Chicago, a display of Celotex insulating board with demonstration of a house model insulated with this material.

Westinghouse Electric & Mfg. Co., Pittsburgh, Pa., control switches and other products.

Minneapolis Heat Regulator Co., Minneapolis, Minn., temperature-control and regulating devices for house-heating systems.

Johns-Manville Corp., New York, a display of insulating material including pipe covering in a model bungalow-type home.

Richardson & Boynton Co., New York, coal and gas-fired boilers.

Gillis & Geoghegan, New York, ash-hoisting equipment.

National Tube Co., Pittsburgh, piping.

New York Technical Men Publish Official Organ

The first number of a publication devoted to the economic and social development of the technical employee has been issued under the auspices of The Union of Technical Engineers, Architects, Draftsmen and Chemists, in New York City, under the title of "Technical Outlook." This union is known as Local 37, Union of Technical Men, and is affiliated with the American Federation of Labor. The initial number of *Technical Outlook* contains the argument for the unionizing of engineering employees and for the use of union tactics.

After reviewing the comparatively slow progress made by technical professional men, a number of remedies are proposed, including:

To educate the public to the value of the technical employees' services so that it would bring its influence to bear on the proper compensation for these men.

To convince employers of technical men that it is to their interest to pay adequate salaries, for adequate salaries make for better relations between employer and employee.

To license all qualified engineers.

Commenting on these remedies, the statement is made that the first remedy falls short, because, although favorable public opinion is a fine asset, the public is too indifferent to fight even its own battles; and it is hopeless to expect that it will engage actively in the contest to help a small group of men.

The second remedy is also declared faulty on the ground that no employer would be handicapped bidding for a job, if all other employers had to pay the same salaries to their technical employees.

Again it is held that licensing of engineers alone will not solve the economic problems of technical employees.

Other methods devised by engineering societies are quoted, including a code of ethics, group insurance, an employment service bureau, a schedule of fees, and a legal service bureau.

In place of these proposed remedies the Union of Technical Men offers the principle of collective bargaining, and declares that this only is possible of attainment through organization. The periodical is issued at 15 Park Row, New York.

American Society of Heating and Ventilating Engineers

Research Laboratory Expands Its Activities

Important actions providing for an expansion of the work of the A. S. H. & V. E. Research Laboratory, were taken at a meeting of the Society's Research Committee, held in Pittsburgh, March 24. Eleven out of the fifteen members of the committee were in attendance. The committee to co-operate with the Rochester School Board also met at the same time.

The day's activities began with a joint luncheon with the members of the National Association of Fan Manufacturers, following which the whole party inspected the Research Laboratory. During the afternoon, the Committee on Research and the Fan Manufacturers Association held a conference at the Bureau of Mines with a view of securing further co-operation in the development of the research work.

One of the important actions taken by the research committee was the ratification of an agreement with the University of Wisconsin, providing for co-operative research to be conducted at Madison, Wis., on air infiltration through building construction. The committee also approved a tentative contract for research to be conducted at the laboratory for other societies or organizations.

An agreement for co-operative research with the Carnegie Institute of Technology also was authorized, and an agreement was effected whereby certain research work being conducted at Harvard University, in the future, will be closely co-ordinated with the parallel work at the laboratory. Carnegie Institute, for several years, has given the laboratory physical and financial co-operation.

In its joint session with the Rochester committee, it developed that the plans for the proposed investigation of the ventilation in the Rochester Public Schools is moving slowly, due to the fact that there are so many divergent views and so many different Rochester committees. The sense of the meeting, which was transmitted to the Rochester Board, was that the Board would serve them and would reduce lost motion if it should proceed forthwith to draw up its own code for the entire series of proposed tests, regardless of approval by any of the committees.

The visitors, in their joint inspection of the laboratory, were shown the infiltration experiments under way, the heat meter and the two psychrometric laboratories. A heat meter installation, in the Hotel Schenley, was in continuous operation on an inside wall. Several subjects were observed in the psychrometric laboratory breathing through gas masks into delicately adjusted apparatus which, combined with other observations, made it possible to measure the entire heat loss with accuracy.

In the discussion of the laboratory's financial condition, it was brought out that the laboratory spends, and needs to spend, about $5 per year per member, in addition to the $10 per year which each member pays with its dues. This difference has been forthcoming from manufacturers of heating and ventilating equipment, and the same plan will be followed this year. It was voted to publish each month, in the journal of the Society, the names of those firms which are contributing to the Research Laboratory.

Society Adopts Limited Chapter Membership Plan

A plan has been authorized by the council, at the suggestion of the Michigan Chapter, whereby a chapter may issue guest cards to a limited number of prospective members, with a view of permitting them to attend meetings, and, in that way, to become interested in the chapter and society.

The Michigan Chapter has already put the plan into effect with good results.

Illinois Chapter Guests of Ilg Electric

One hundred and eighteen members and guests of the Illinois Chapter were the guests of the Ilg Electric Ventilating Company, of Chicago, in connection with the chapter's April meeting, April 11. In addition to an inspection of the Ilg Electric plant, dinner was served in the dining hall at the factory where the chapter meeting was held, and then the party witnessed a demonstration of the apparatus under discussion.

A. G. Sutcliffe, of the Ilg Company, was the speaker of the evening, his subject being "Recent Developments in the Fan and Blower Industry." It was at the conclusion of Mr. Sutcliffe's address that the party observed the operation of the apparatus to which he referred. Afterwards the meeting was resumed in the dining hall, where questions on the points brought out were answered by Mr. Sutcliffe.

An interesting announcement was made by President Martin to the effect that a significant amendment to the Chicago Ventilation Ordinance had been adopted by the Chicago city council, exempting private schools from the necessity of conforming to the code's requirements. Nothing concerning the matter was known previous to the meeting at which the amendment was adopted. No hearings were held and the chapter committee, which is working with the Chicago Health Department, did not have an opportunity to appear before the city council.

President Martin pointed out that the action of the city council might well be regarded as the first step in a movement leading to the elimination of requirements pertaining to school ventilation in general. He stated that the chapter council would appoint a committee to act in the matter.

Carl A. Nilson, of Nilson Bros., and William A. Hennings, of Dewar and Carrington, were elected to membership.

It was announced that the annual chapter golf tournament would be held at the Glen Oak Club, May 19, and that the annual dinner dance would be held at the Palmer House, May 20.

The meeting closed with the showing of motion pictures taken at the last chapter golf tournament, in May 1926, followed by views of the 1926 Western Trades tournament.

Illinois Chapter Gets Advance Report of Illinois Research

Progress, and an optimistic outlook for the society and the industry, was the keynote of the Illinois March dinner and meeting. The presence of Prof. A. C. Willard as guest speaker brought out a large attendance, 128 members and guests being present.

President Martin then introduced C. D. Brownell, of Champaign, Ill., chairman, Advisory Board, Illinois Research Committee. Mr. Brownell outlined the favorable progress in the research at Illinois University, instigated and supported by the Illinois Master Plumbers Association, the Boiler & Radiator Manufacturers Association, and others. He said that the first year of the work had been completed with gratifying results. Mr. Brownell stated that many a good design had been put in wrong and that the results of the research work were certain to be of great benefit to the installing contractors. He asked the support of everyone interested in simple heating plans, and stated that his committee would gladly co-operate with any other competent body and strive to prevent duplication of the outlined program.

President Martin, before presenting Professor Willard, expressed pride in Illinois University, now the third largest in the country. He referred to the student body of 12,000 under 1200 instructors, and the annual appropriation of ten and one half millions, not including another million a year for buildings.

Professor Willard, after being introduced, stated that the research referred to by Mr. Brownell—Practical Aspects of Steam and Hot Water Heating—was the work of Morris K. Fahnestock at the University. Professor Willard explained that the rudimentary subjects were just

as difficult as the advanced problems in research, and that in the present work the result striven for was help of practical value to steamfitters. The results too, he pointed out, would be of value to builders and designers.

The subject of Professor Willard's illustrated talk—one of the first results of the work—was the effect of enclosures over direct radiators. Since the results are soon to be published in a University Bulletin, Professor Willard gave his talk as confidential and requested that the technical press refrain from reporting it.

Prof. Herbert S. Philbrick, Dean of Engineering, Northwestern University, was introduced by President Martin, who then presented Harry Hart as past society president and now president of the National Heating & Piping Contractors Association. Samuel R. Lewis was next presented as chairman of Research Committee. Mr. Lewis stated that following the February Chapter meeting Mr. Houghten and he went to the Wisconsin University at Madison. The University matched $1000 from the Laboratory for a scholarship, and reported a greatly enlarged engineering course and the University's ability to compete with other large institutions. Stopping at Milwaukee, Mr. Lewis found much to lend encouragement, and, in closing his remarks, stated that $2000 for the Laboratory had been received that day.

The following were elected to Chapter membership: H. A. Birkholz, L. H. Prentice Company; C. E. Dickinson, Dickinson Heating Company; E. C. Lathrop, Celotex Company; L. B. Miller, McDonnell & Miller, and J. R. Vernon, Johnson Service Company.

Thornton Lewis Addresses Michigan Chapter

Thornton Lewis, second vice-president of the A.S.H. & V.E., and president of the York Heating and Ventilating Corp., Philadelphia, was the principal speaker at the April meeting of the Michigan Chapter, held April 11, in the new Masonic Building, Detroit. He prefaced his talk on applications of unit heaters by pointing out the changes that are going on in the art of heating and ventilating, and he mentioned particularly the rating of radiation, rating of boilers, comfort charts, new methods of applying indirect radiation, and modifications in connection with mechanical ventilation.

He emphasized the point that it is the society's job to take the necessary leadership in readjusting these continual changes and the establishment of new standards. He also urged the popularization of heating and ventilation through the publication of articles on the subject in the general magazines.

In connection with the chapter's limited membership campaign, by which a limited number of guest cards are issued to prospective members, J. L. Fuller reported that 57 applications had been received.

J. R. McColl was elected to represent the Michigan Chapter on the society's nominating committee, with H. W. Whitten, alternate.

President MacIntire appointed Ray Wilde, N. B. Hubbard and Fred Johnson as the chapter's nominating committee.

Talk on Boiler and Steam Specialty Troubles

More than 100 members and guests of the Massachusetts Chapter were on hand at the chapter's March meeting, at the Engineers' Club, to hear the address of C. V. Haynes, vice-president of the Hoffman Specialty Company, on "Boiler and Steam Specialty Troubles." A lively discussion followed Mr. Haynes's talk, indicating the deep interest in the subject. It was announced that the April meeting was to be devoted to light-weight radiation and heat cabinets, with Reuben N. Trane, president of The Trane Company, as the chief speaker.

Minnesota Chapter Inspects American Radiator Plant

Forty members and guests of the Minnesota Chapter were taken on an inspection tour through the plant of the American Radiator Company, in St. Paul, the occasion being the chapter's March meeting. Following the inspection, the members of the party were the guests of the American Radiator Company at dinner at the plant.

After giving a vote of thanks to A. M. Wagner, branch manager, who acted as host, the party listened to a talk by Mr. Wagner on the history of cast-iron radiator manufacture. Mr. Wagner, as reported in the A.S.H. & V.E. *Journal* for April, said in part:

"The present cast-iron radiator is a successor to the wrought-iron tube radiator. The tube radiator was first made in the early part of the nineteenth century. I think the first steam heating plant used in the White House was installed during President Jackson's administration.

"The first wholly cast-iron radiators were the Whittier and the Bundy loop. These were placed on the market in 1873 and 1874.

"One of the first cast-iron radiators to be exploited to any extent was made by the late John B. Pierce, nearly 40 years ago, in a small wooden shed in Buffalo. The manufacturer of this radiator was the forerunner of a larger company, the Pierce Steam Heating Company, which became a part of the American Radiator Company.

"It is probable that the H. B. Smith Company, of Westfield, Mass., were the pioneer manufacturers of cast-iron boilers for steam heating. The Gold boiler was undoubtedly the first cast-iron boiler manufactured and was marketed in 1871 or 1872. The original cast-iron boilers were made on specifications submitted for each installation.

"In the early days such companies as the H. B. Smith Company, and the Gurney Heater Company, were not only manufacturers of cast-iron boilers and radiators but were installers; in other words, the Gurney Company would take a steam heating contract for a building and would then make the material necessary for the installation.

The American Radiator Company of Illinois was formed January, 1, 1892, and was reincorporated on January 1, 1899. It was the first manufacturer to sell radiators exclusively through the contracting trade. All manufacturers heretofore had sold through the few contractors there were and had sold direct to the consumer. It was quite a departure when they announced that they would sell only through the contracting trade and this step has undoubtedly had a great influence in the development of this great industry.

"The real difficulty in the beginning was to convince the public that radiator heat was safe, heathful and economical. Quite naturally, architects and engineers saw the possibilities and advantages of steam heating before the average consumer."

Toronto Chapter Discusses Boiler Priming

Causes of foaming and excessive priming of steam boilers, and methods of overcoming these troubles, were the principal topics discussed at the March meeting of the Ontario Chapter, held in Toronto. The subject was presented by H. H. Angus. It was brought out that while priming in steam boilers very often is due to impure water, it may be caused by too small a steam space, too small free steam disengaging water surface, and lack of proper circulation in the boiler. The last three, of course, are due to the design of the boiler. However, dealing with the operation of boilers and not their design, and considering cases where the foaming and excessive priming are due to the presence of oil, grease, pipe scale in the boiler, piping and radiators, it was brought out that this accumulation must be thrown off through some blow-off pipe. As the oil is lighter than water, it will rise to the top of the water and must be blown off at that point, while the dirt will come off, partly from the upper part of the boiler and partly from the bottom.

The first thing to do, it was stated, is to connect a blow-off pipe with gate valve from the top blow-off opening to a point outside the building. If no blow-off opening is provided at the surface, remove the safety valve and connect the outside blow-off pipe to this opening, this pipe being the same size as the safety valve opening.

The next thing to do is to shut off main valves or radiator valves so as to isolate the boiler from the rest of the system.

The boiler should then be filled with water to the top of the gauge glass and a hot fire built. The top blow-off valve should be opened and the pressure of 15 lbs. be maintained for about four hours during which the blow-off is to be opened and fresh, clean water supplied to keep the water level constant for three hours. During the last hour the boiler should be kept filled with water. After this has been done, the water should be allowed to run through the top blow-off until the water line is at the top of the gauge glass, and then the top blow-off valve is to be closed. When the steam is at 15 lbs., the fire should be quickly drawn and the bottom blow-off valve opened and the boiler completely drained. The boiler should be allowed to cool and, after this, the safety valve should be replaced, the blow-off valve closed and the boiler filled, and the system operated as usual.

Another suggestion was that if trouble is experienced, take a vessel about 3-in. diameter and 10-in. or 12-in. deep, and from the gauge cock on the boiler draw off 3 in. of water into the vessel, boil it over a fire and examine the way the steam is liberated.

It was announced that Dean F. Paul Anderson would be the speaker at the chapter's April meeting, his subject to be "School Ventilation."

Philadelphia Chapter's New Officers

New officers of the Philadelphia Chapter, elected at the chapter's January meeting, which took the form of a "jamboree" on the good ship Leaky Radiator, "anchored" at Girard's Tavern, are: President, R. E. Jones; vice-president, R. V. Frost; secretary, Stephen S. Whitby; treasurer, J. V. Cavileer. Board of governors: Benjamin Adams, H. G. Black and Benjamin Wilson.

New York Chapter Elects New Officers

New officers of the New York Chapter, elected by ballot and announced at the April meeting, held at the Building Trades Club, April 18, are:

President, R. A. Wolff; vice-president, H. Berkeley Hedges; treasurer, Frederick E. W. Beebe; secretary, E. B. Johnson. Mr. Beebe and Mr. Johnson were re-elected. Alfred J. Engle and Edmund J. Ritchie were elected to the board of governors.

Dean F. Paul Anderson, president of the society, was the guest of honor and addressed the members on the relation of engineering to education. Dean Anderson also discussed some of the subjects which are at present agitating the society and asked for helpful suggestions to aid in the intelligent handling of these problems. Among the topics brought up were the Research Laboratory and the question of dues.

The meeting was preceded by an inspection trip through the Federal Reserve Bank of New York, which was the subject for discussion at the chapter's February meeting. The party was taken through the boiler room and was shown the general arrangement of the mechanical equipment.

St. Louis Chapter Committee Appointments

Officers and committees of the St. Louis chapter of the A.S.H. & V.E. for the ensuing year, have been announced as follows: President, A. E. Humphreys; first vice-president, V. D. Rossman; second vice-president, E. S. Hallett; secretary, C. G. Buder, and treasurer, Edw. H. Quentin. Board of governors, E. B. Langenberg, Will Sodemann, F. J. McMorran and C. A. Pickett. The committee chairmen for the coming year are: E. S. Hallett, J. M. Foster, F. J. McMorran, R. E. Graves, C. A. Pickett, A. M. Lane, E. B. Langenberg, L. Walter Moon and Thomas J. Hester.

Cleveland Chapter Hears Talk on Chimneys

Martin A. Rooney, engineer, of the American Radiator Company, addressed the Cleveland Chapter, at its March meeting, on the subject of "Chimneys." The meeting approved the action taken by the chapter's executive committee in sending a resolution of protest against Senate Bill No. 255, which embodies the proposed new Ohio State Building Code. The bill as drafted, it was claimed, would give legislative powers to non-legislative committees and would take from the lower courts the power to review, suspend or delay action and would place this power with the Supreme court. The chapter also took the position that the present State code should be revised and modified and not discarded and that Bill No. 255 should not be made a part of the State code.

The speaker at the chapter's February meeting was D. C. Lindsay, of the Carrier Engineering Corporation, whose subject was "Air Conditioning, Ventilation and Refrigeration."

Heating and Piping Contractors National Association

Many Trade Problems Down for Discussion at Annual Convention

NUMEROUS live topics being discussed in the heating industry are included in the program of the thirty-eighth annual convention of the Heating and Piping Contractors National Association, which will be held at West Baden, Ind., Wednesday, Thursday, Friday, and Saturday, June 1-4, with headquarters at the West Baden Springs Hotel. Following the custom of previous years, the first day will be given over to a meeting of the board of directors, to registration, and to a dinner of the "Old Guard," made up of past presidents of the association. The same evening there will be a get-together party with a barn dance.

The first convention session will be held Thursday morning, June 2. There will be no afternoon sessions any day, each afternoon being left free for the full program of entertainment features which has been arranged, including bowling, baseball and golf. On Friday afternoon the entire party will visit Marengo Cave.

A "certified heating luncheon" is scheduled for Friday noon, while the convention dinner dance will take place Thursday, June 2.

Following is the program of the convention sessions:

MORNING SESSION, JUNE 2

President's address.
Labor forum.
Presentation of Spring labor survey.
Keeping steamfitting a two-man trade.
What shall we teach our steamfitters' helpers?
Appointment of convention committees.
Deferred-payment plan for selling heating systems.
The necessity of maintaining the present channels of distributing heating material.

MORNING SESSION, JUNE 3

Report of board of directors.
Report of treasurer.
Report of auditing committee.
Report of secretary.
Report of credential committee.
Report of committee on certified heating.
Research work for the heating industry.
Report of committee on standardization.
Report of boiler output committee.
Report of secretaries' conference.
Report of membership committee.
Report of convention committees.

MORNING SESSION, JUNE 4

Report of convention committees.
The work of the National Trade Extension Bureau.
Welding in the heating industry.
Unfinished and new business.
Election and installation of officers.

New York State Heating Contractors Endorse Certified Heating

APPROVAL of the certified heating movement and a pledge of assistance in promoting the certified heating program in New York State was given by unanimous vote at the thirty-second annual meeting of the New York State Association, in Syracuse, N. Y., April 20-21. An entire afternoon session was given over to the subject, the speakers including A. R. Herske, manager of the Heating and Piping Contractors Cleveland Association; Chairman Herbert A. Snow of the Committee on Certified Heating of the national association; Walter C. Kimball, vice-president of the International Heater Company, who expressed his company's endorsement of certified heating as evidenced in the certifying of all of its own products to carry the loads for which they are rated; and Robert T. Herz, of Buckley, Dement & Company, who talked on using certified heating as the focal point for co-operative advertising. Mr. Herz described in detail the campaign which the Chicago association has carried on for the past two years. He also told of plans now being completed for compiling material which can be used by any local association in selling the idea of certified heating to the public.

Following is the text of the resolution adopted by the convention:

Whereas the Committee on Certified Heating of the Heating and Piping Contractors National Association has made a careful study of all the existing data on certified heating and has recommended a program for establishing certified heating, and

Whereas, the board of directors of the Heating and Piping Contractors National Association approved certified heating as a means of increasing the good-will of the buying public toward our industry; now therefore be it

Resolved, that the Heating and Piping Contractors New York State Association, in convention assembled, expresses its hearty approval of certified heating and pledges its assistance in promoting this program in New York State.

Cecil W. Farrar, president of the Excelso Products Corporation, spoke on "Living Comfort." He declared it is time for the heating industry to stop selling cast-iron, either in the shape of boilers or radiators, and to put the same effort into selling the public living comfort.

Other speakers were M. J. Beirn, of the American Radiator Company, who presented some encouraging statistics regarding business prospects for the coming year; W. T. Leonard, of the Columbia Radiator Company, who spoke on "Certified Salesmanship," and Harold Thompson, of the Oster Manufacturing Company, whose topic was "Scientific Salesmanship."

All of the officers were re-elected, as follows: President, William G. Fraser, Buffalo; vice-president, William J. Olvany, New York; secretary-treasurer, Robert B. Miller, New York.

New Officers of Heating Contractors New York City Association

New officers of the Heating and Piping Contractors New York City Association, elected at its forty-second annual meeting, held March 22, are:

President, H. Richard Stern, Johnson & Morris; vice-president, Robert B. Miller, Miller and Brady, Inc.; treasurer, Robert D. Williams, Baker, Smith and Co., Inc. Board of Directors in addition to officers named, were John R. Alpine, Grinnell Company, Inc., and Robert C. Purvis, Purvis & Shelton, Inc. The Board elected Henry B. Gombers as secretary for the thirty-first time.

H. Richard Stern
New President of the Heating and Piping Contractors New York City Association

During the meeting, reference was made to the fact that it was thirty years to a day since the arbitration of the strike on the Columbia University buildings was begun, which was the first close contact of Mr. Gombers with the heating industry, as he acted as secretary of the arbitration conference.

In appreciation of his long service Mr. Gombers was presented with a table lamp and a wing chair.

Directions for Adopting Certified Heating

Under the heading of "Program for Establishing Certified Heating," the Board of Directors of the Heating and Piping Contractors National Association, at its Spring meeting, authorized the publication of a manual which gives the successive steps to be taken by a group of heating and piping contractors who desire to benefit by this co-operative work. The development of an "Office Manual" for executives of local associations, affiliated with the National Association, was also approved.

The association's committee on certified heating was given the task of working out publicity campaigns which readily could be adjusted to the needs of local associations, especially those just undertaking the establishment of certified heating.

At the same meeting of the Board of Directors, W. L. Fleisher, chairman of the committee on standardization reported that this committee is now working on standards for pipe sizes and the computation of exposure factors for a number of cities which have asked for these data, so that they can adopt the association's engineering standards for figuring radiation. Mr. Fleisher emphasized the fact that the standards were constantly being developed, and that the study incident thereto was raising new questions upon which fundamental research was necessary.

In connection with the plans for the association's forthcoming annual convention in West Baden Springs, Ind., June 1-4, it was stated that certified heating will be given a prominent place on the program. A place will also be given to the labor forum, at which present conditions in the industry, as shown by the Association's Spring Labor Survey, and the training of steam fitters will be discussed.

Death of Louis H. Quackenboss

Few men in the heating and ventilating industry have enjoyed the friendship of such a wide circle of acquaintances as Louis H. Quackenboss, representative of Warren Webster & Company, in the New York district, whose death occurred March 14 at his home in Bayside, L. I. Mr. Quackenboss had been connected with Warren Webster & Company since 1906, and had represented the company in connection with the sale of heating and ventilating equipment for some of the largest and most important buildings in the metropolitan area.

Mr. Quackenboss was born in Philadelphia, where he started his business career with Merchant & Evans of that city. He came to New York about 1887, and represented Merchant & Evans throughout New England and New York State. About 1904, he became connected with the Kinnear Pressed Steel Radiator Company. There he remained until he joined the sales force of Warren Webster & Company in 1906. Mr. Quackenboss was prominent in eastern masonic circles, his affiliations being Kismet Temple, Clinton Commandery No. 14, Orient Chapter. He also was past master of Commonwealth Lodge. He is survived by his wife.

Grates for Burning Small-Sized Anthracite

Previous articles in this series are as follows:

1.—*Neemes, October,* 1926.
2.—*Johnson, November,* 1926.
3.—*Rath, November,* 1926.
4.—*Pyramid, December,* 1927
5.—*Culm-Burn, December,* 1926.
6.—*Atlas, January,* 1927.
7.—*Spencer Heater, February,* 1927.
8.—*Grieve Grates, March,* 1927.
9.—*Tread-Kill, April,* 1927.

10. Economy

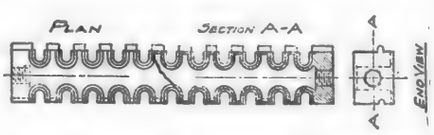
DOME-SHAPED air distributors, so designed that air is forced radially through the firebed, characterize the Economy grate, manufactured by the Economy Grate & Equipment Co., 410-412 East 34th St., New York. This feature, coupled with the air-tight construction of the grate itself, makes it possible to burn hard coal as small as No. 3 buckwheat and anthracite screenings.

Economy equipment comprises water-cooled grate bars, 4 in. wide, 3 in. deep, and of the length required for the boiler furnace. The sides of the grate bars have vertical semicircular grooves extending from top to bottom. When the grate bars are placed side by side, in an abutting position, the adjoined grooves form tubular channels, and in these channels are placed the dome-shaped air distributors.

Air-tight construction of the grate is secured by casting the grate bars with tongue and groove. When snugly fitted together, the only outlet for the air is through the distributors. By perforating the distributors radially the air is forced across the grate, instead of straight up, in that way securing a more even combustion and eliminating dead spots at the end and sides.

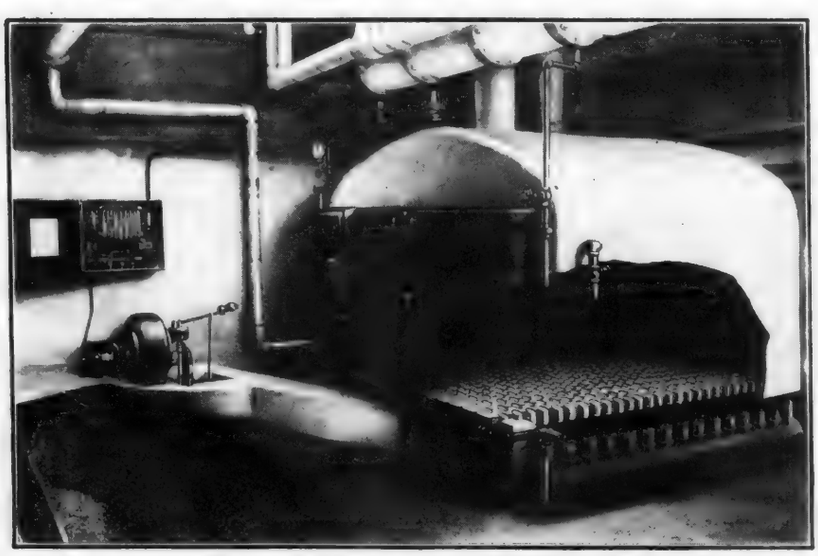
Hollow construction of the grate bars provides a waterway, so shaped as to entirely surround the distributors, in that way protecting them from damage through overheating. Each grate bar has a screw-head opening at either end and is connected with manifolds in the shape of wrought-iron connections, permitting free circulation of water. Care has been taken to make all connections outside of the fire box.

Proper circulation of air plays a large part in the design of the Economy grate. An electric motor-driven blower forces air into the sealed ash-pit and up through the air distributors. The desired control is secured through an automatically-regulated damper placed in the air line. Steam pressure is used to actuate the damper which allows air



Cross Section of Economy Grate Bar

to enter the ash-pit as needed to maintain a uniform steam pressure. In addition, an electric switch is provided automatically to control the motor and to start or stop it at any desired pressure. With this arrangement the fire may be banked by shutting off the motor and can be made immediately active again by starting the motor.



A Typical Economy Water-Cooled Grate Installation

Section of Economy Grate Showing Air-Tight Construction and Arrangement of Air Distributors

Heating and Piping Contractors Boston Association elected the following officers at its annual meeting: President, Maurice E. Chase; vice-president, Thomas O'Callaghan; treasurer, Peter J. McMurrer; clerk, E. A. Dusossoit. Directors: F. S. Cleghorn, E. A. Dusossoit, I. D. McLean and R. S. Franklin. Standards Committee: R. S. Franklin, L. R. Stetson and E. C. Whitaker. Trade Relations: F. A. Merrill, H. E. Barber and E. A. Dusossoit. Examining Board: F. W. Howard, I. D. McLean and Edgar Shaw. Legislation Committee: E. R. Stone, J. P. Dwyer and Thomas O'Callaghan. Welfare Committee: P. J. McMurrer, M. E. Chase and W. S. Cousens.

Although only about 37% of the entire population of the United States was gainfully occupied in 1925, according to an estimate made by the National Industrial Conference Board, 247 Park Ave., New York, more than 73%, or nearly three-fourths of all the personal income reported in 1924, was derived from personal service or business activity, according to an analysis of incomes made by the same organization. Out of a total of $29,128,000,000 of personal gross incomes, ranging from $1,000 net a year upwards, in 1924, 46.2% consisted of wages and salaries or commissions, fees, etc., 27.3% of incomes derived from personal business activities in trade, commerce and farming, and only 26.5% represented returns on investments.

Washington, D. C.—A distinguished list of speakers, including President Coolidge and Secretary of Commerce Hoover, will address the fifteenth annual meeting of the Chamber of Commerce of the United States, which will be held in Washington, May 2-5.

Present Practice in Vapor Heating

Previous articles in this series are:

1. *Webster Type R Modulation System, August*, 1926.
2. *Dunham Home Heating System, August*, 1926.
3. *The Illinois System, September*, 1926.
4. *Hoffman Controlled Heat, September*, 1926.
5. *The Mouat System, October*, 1926.
6. *The Trane System, November*, 1926.
7. *The Sarco System, December*, 1926.
8. *The O-E Perfect 3-in-1 System, January*, 1927.
9. *The Gorton System, February*, 1927.

10. The Barclay System

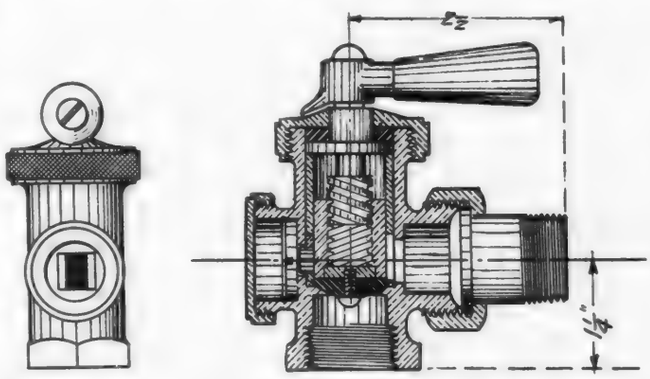
ONE of the simplest types of vapor heating is that known as the Barclay system, sponsored by the Barclay Sales and Engineering Co., Woolworth Building, New York. This system does not employ radiator traps, and drips the ends of the steam mains through water-seals into a dry return.

Fig. 1 shows a typical Barclay system with the piping layout indicated in perspective. It will be noted that the steam main extends from the boiler uptakes, which constitute the high point of the main, and pitches down from this point to the end of the run. Where the main terminates a 48-in. water seal is used to drain the condensation in the return main. The return main grades down back toward the boiler in the opposite direction to that of the steam main. This is all there is to the piping system, and the addition of a few specialties completes the installation.

To control the steam flow to each radiator the Barclay adjustable radiator valve is used. This valve is illustrated in Fig. 2; it is made in one size only. As the radiator valve, perhaps, is the most important device used on the system, its features should receive careful consideration.

In the first place, although this valve is made in ¾-in. size only, it has the flexible property of being adjustable to any radiator from 5 sq. ft. to 200 sq. ft. in heating surface, which allows the installation of one style and size of valve throughout a whole heating system, leaving the individual setting to suit each radiator until later. This subsequent adjustment is made by means of a shutter which may be set to suit the particular radiator, on which the valve is installed, by turning with a common screw driver. A calibrated scale indicator shows when the shutter has been turned to suit any given size of radiator, and the ratings on the scale are based on a steam pressure of 5 oz., at which pressure the manufacturer states the maximum heating service is secured.

A view of the valve showing the calibrated scale is illustrated. These shutters, after once being set according to the scale, should never afterwards be touched. The valve is a packless one, with non-rising spindle and is provided with either wheel or lever handle.



Adjustable Shutters

Fig. 2. Construction of Barclay Adjustable Radiator Valve

Calibrated Shutter Adjusting Device

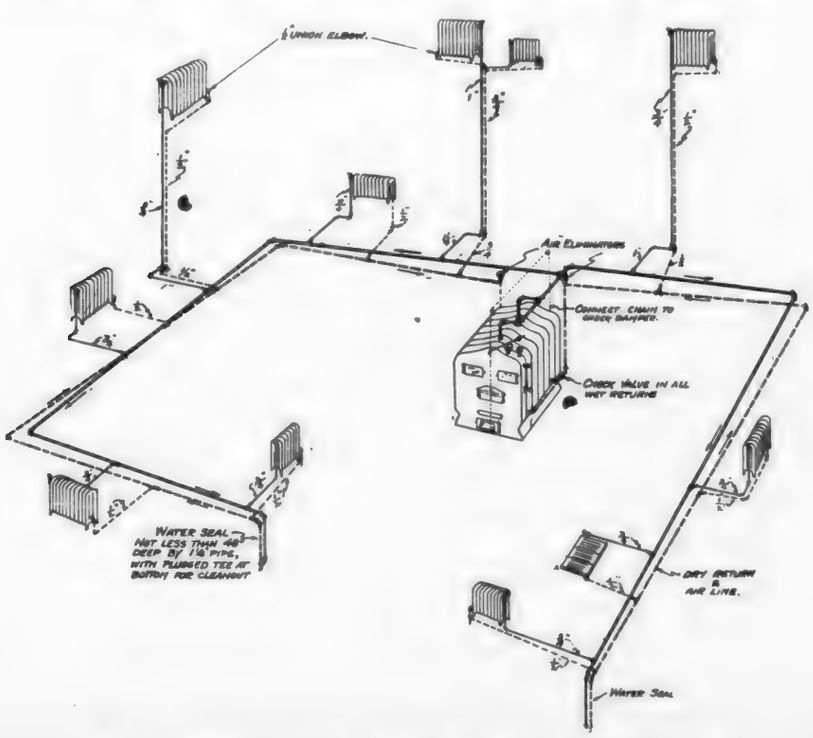
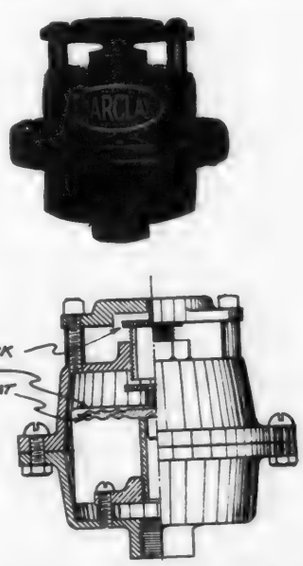

UNION ELBOW
AIR ELIMINATOR
CONNECT CHAIN TO CHECK VALVE
CHECK VALVE IN ALL WET RETURNS
WATER SEAL NOT LESS THAN 48" DEEP BY 1½ PIPE, WITH PLUGGED TEE AT BOTTOM FOR CLEANOUT
DRY RETURN & AIR LINE
WATER SEAL

Fig. 1. Typical Layout of Barclay Vapor Heating System



Figs. 3 and 4. Exterior and Broken Views of Barclay Air Eliminator

On the return end of each radiator is placed a union radiator elbow, these elbows all being of ½-in. in size, and having to care only for the condensation from the radiator. Steam is prevented from entering the return line by the setting of the inlet valve. It is so arranged as to heat only 80% of the radiator to which it is applied. The remaining 20% of the radiator surface is used to condense any surplus vapor and to cool the

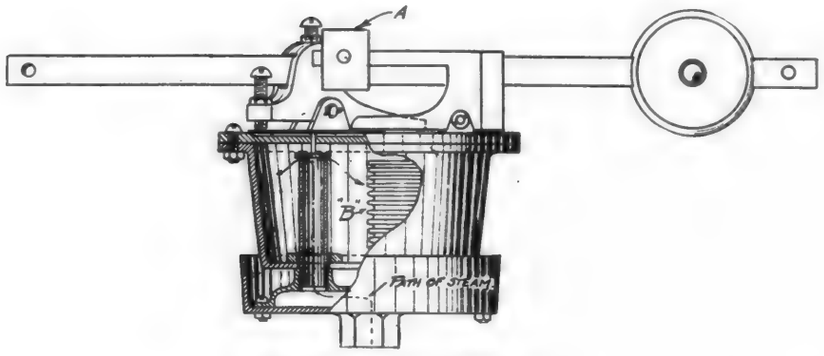


Fig. 5. Damper Regulator

condensate so that the maximum heat output is obtained from the steam furnished. With the inlet valve already described, the two constitute the only radiator attachments necessary.

It will be noted on the diagram of the system that where the return pipe drops down to enter the boiler an air eliminator is designated. This air eliminator is shown in Figs. 3 and 4, and may be described as an automatic valve somewhat on the style of a float, a thermostat and a ball check. The eliminator will permit the passage of air freely but closes as soon as any water or vapor reaches it. After all the air is forced out of the system, the check prevents its return and thus a partial vacuum is formed in the system.

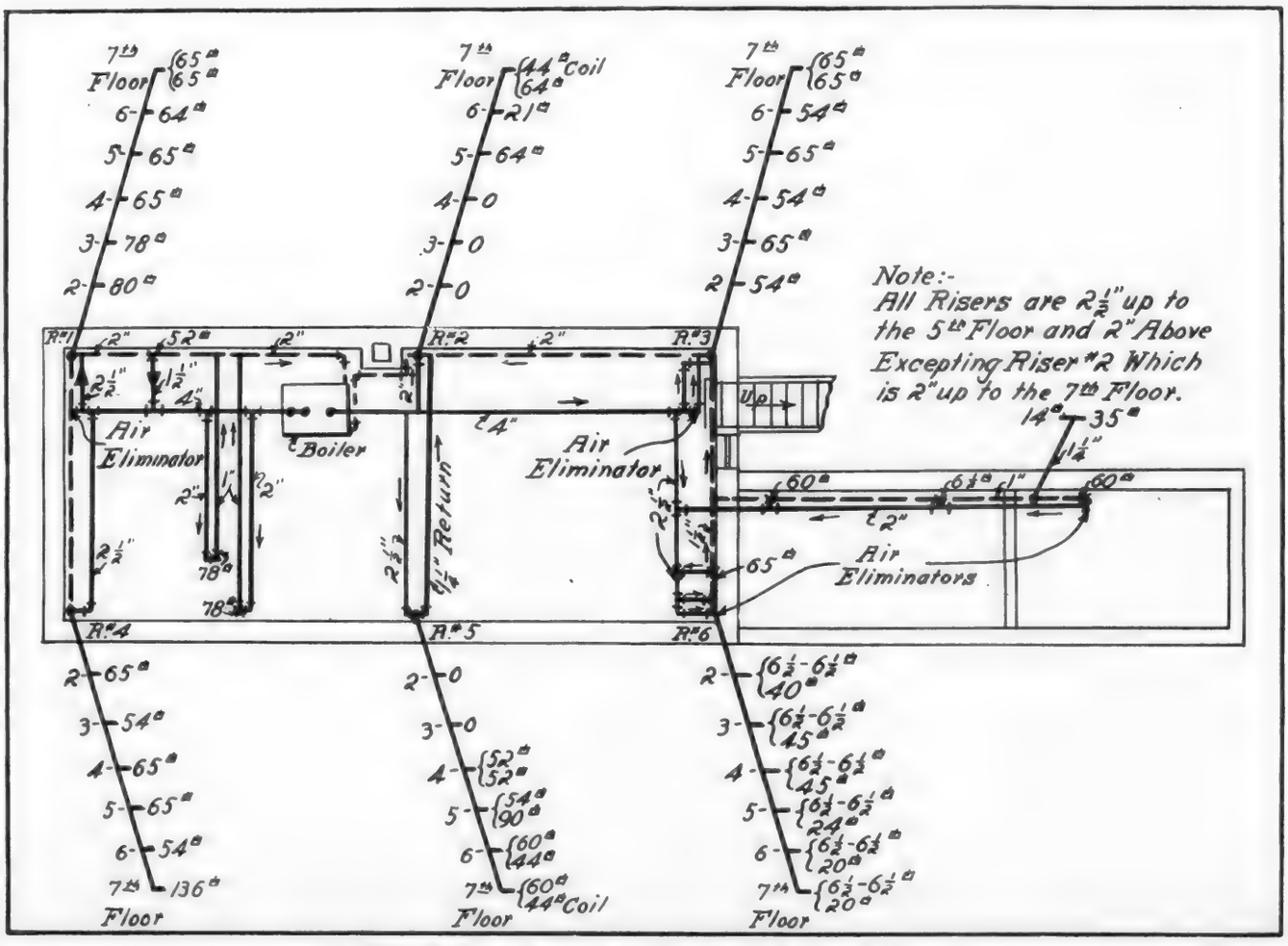
On the boiler are installed the vapor regulator and the pressure gauge. The regulator (see Fig. 5) controls the draft doors and has a sensitive action, being designed to carry pressures anywhere from 2 oz. to 12 oz. The pressure gauge is graduated in 2-oz. intervals from zero to 1 lb., and then by single pounds up to 10 lbs. Where the returns enter the boiler any good dependable check valve may be utilized. It is recommended that the water-seals used at the ends of the mains be 48 in. deep, and that they be provided with a plugged tee at the bottom so that scale and sediment may be removed when necessary.

Changing Over a One-Pipe Gravity Steam System to Vapor

As an example of what can be done in remodeling old and unsatisfactory heating systems, the case is cited of the Fridenberg Building, at 908 Chestnut St., Philadelphia. In this structure there was installed an old one-pipe gravity heating system upon which it was necessary to carry about 5 lbs. of steam to reach the sixth and seventh floors.

The main building is 28 ft. wide, 64 ft. deep, and seven stories high. On the rear is an extension 15 ft. wide and 47 ft. long which is two stories high. When first called in, the contractor for the work, the G. W. Hartman Heating Company, of Philadelphia, found that not only was it necessary to carry the pressure mentioned, but it was also well on toward noon before the four top floors were heated, especially in severe weather.

As a first requisite the Hartman Heating Company, checked up on the radiation and found a shortage on some of the upper floors which amounted in the aggregate to 250 sq. ft. Adding this to the radiation already installed brought the total radiation in the building up to 2530 sq. ft., with a Mills boiler rated



One-Pipe Gravity Steam System as Changed Over to Vapor

at 5400 sq. ft. to furnish steam for the whole job.

The contractor's first idea was to change the installation over into a two-pipe vapor steam system, but investigation showed that this would necessitate cutting a considerable number of additional holes through the solid concrete floor, which would be not only expensive, but objectionable to the owner. The solution which then suggested itself was to employ a one-pipe vapor system, of the Gorton type.

While the original risers were somewhat small, it was impossible to increase them more than one pipe size unless all the pipe-sleeves were cut out of the floor and larger sleeves substituted, which would have been almost as expensive a proposition as the cutting of additional holes for a two-pipe vapor installation. Therefore the risers were increased one size only, and with this increase had to carry the additional 250 sq. ft. of new radiation.

The steam mains running to the front and back of the building were increased from 3½ to 4 in. and a new supply line was run to feed the rear extension; no changes were made in the return piping or drips. An air-eliminator was placed on the end of each main, as shown in the accompanying illustration, with the result that the radiators on the seventh floor heated up practically in the same time as the first floor radiators.

Gorton radiator valves and vapor air relief valves were placed on all radiators. In spite of the scanty pipe sizes and the added radiation, the system was found to circulate on a vapor pressure of three ounces and to give satisfaction to the occupants of the building, who had suffered for years from poor heating.

The owner states that he is burning no more coal now than before the 250 sq. ft. of radiation were added, and his engineer reports that his fires go longer without attention.

Tests of Cabot's Quilt

Recent tests upon two layers of double-ply Cabot's quilt, conducted by Gordon B. Wilkes of the Massachusetts Institute of Technology, give a very clear idea of the insulating value of this material. The conditions of the test are as follows:

Air Temp. Deg. F.		
Inside	Outside	H_f
130	70	0.15
Surface Temp. Deg. F.		
Inside	Outside	K_f
126	77	0.19

H_f equals B. T. U. per hour per square foot per deg. F. temperature difference between the *air* on the two sides.

K_f equals B. T. U. per hour per square foot per deg. F. temperature difference between the two surfaces of the material, per inch thickness. In this case the thickness of the two layers of double-ply quilt was assumed to be 1-in.

Following are the results obtained, including the density:

Sample	Thickness In.	Density Lbs. per Cu. Ft.	H_f	K_f
Cabot single-ply	0.3	5.6	0.41	0.24
Cabot double-ply	0.5	6.2	0.26	0.20
Cabot double-ply, two layers	1.0	6.2	0.15	0.19

In commenting upon the tests, Mr. Wilkes states that the value K_f is uncertain, due to the doubt of the actual thickness of the material, but this uncertainty does not affect the value of H_f.

Using the values as given for a basis of calculation, Mr. Wilkes has extended the value of H_f for an actual wall in a frame structure, thus indicating in a rough way the heat loss with different sorts of insulation.

Type of Construction	H_f
Clapboard, sheathing, studding, lath and plaster	0.29
Same, with one layer Cabot single-ply	0.21
Same, with one layer Cabot double-ply	0.17
Same, with two layers Cabot double-ply	0.12
Same, with three layers Cabot double-ply	0.09

"Ventilation and Health"

In a volume which appears under the authorship of Thomas D. Wood, A.M., M.D., professor of physical education and advisor in health education, Teachers College, Columbia University, and Ethel M. Hendriksen, formerly executive secretary, Tuberculosis and Public Health Association of Rochester and Monroe County, New York, so much bias is shown and such studied indifference manifested toward the extensive research conducted by the A.S.H & V.E. Research Laboratory as to give the book the appearance of forming one of the series of propaganda efforts put out by the open-window enthusiasts. In the foreword, for instance, the authors state:

"...so now the ventilating engineers often block progress toward good ventilation," and "...so to-day men outside of the engineering field are chiefly responsible for the advance in the science of ventilation." Inasmuch as research in the laboratory in Pittsburgh in which, by the way, the U. S. Bureau of Mines and the U. S. Public Health Service participated, is generally acknowledged to be the most monumental scientific study ever made of air conditioning, the failure of the authors to consider these studies seems inexplicable on any other basis than that mentioned.

A reference to the Synthetic Air Chart, devised originally by Dr. E. Vernon Hill, contains the statement that "when engineers attempt to determine the percentage of perfect ventilation by means of an air chart in which temperature and air movement are rated on an equal basis with dust, bacteria, odors and carbon dioxide, it is obvious that the result will be misleading." The difficulty with this statement is that all of these items are not considered on an equal basis in the Synthetic Air Chart.

At one point pictures are presented of two schoolrooms providing "ideal" conditions. One is a Watt school in which, to run true to form, the windows *must be opened from the top*, as well as from the bottom. The other is a Wheeler school, from which the "modified open-window gravity" idea was taken. Here, according to the New York State Commission on Ventilation, the windows *must never be opened at the top.* Evidently the authors see no incongruity in placing these illustrations in the same book, let alone on the same page.

One of the most naive statements is the one (Page 57) reading, "to constantly heat incoming cold air requires the consumption of large quantities of fuel and current." This is a damaging admission to make when it is considered that it is precisely what happens with a "modified open-window gravity" scheme.

Air-conditioning engineers will prick up their ears at another statement (Pages 173, 174 and 175) that: "if room air is very dry the difference (between dry and wet-bulb readings) will be very little, and if it is full of vapor, as from a steaming kettle, the difference will be marked." Unfortunately, this is but one of a number of scientific misstatements which mar the authors' discussion of the principles involved in the science of air conditioning. Size 5 in. x 7½ in. Pp. 210. Published by D. Appleton & Co., New York, or may be had through the book department of THE HEATING AND VENTILATING MAGAZINE. Cloth, $2.

BULLETIN OF THE CARNEGIE INSTITUTE OF TECHNOLOGY, containing the proceedings of the third annual three-day institute conducted by the Department of Plumbing, Heating and Ventilation, has been issued by the Department of Industrial Relations of the institute and is listed as Series 22, No. 8. Included in the contents are Professor Samuel E. Dibble's lecture on "Welding in the Plumbing and Heating Industry," a lecture by Professor Clifford C. Dunnells on "Plumbing and Heating Installation in Building Construction," and an address by Dr. H. Ryerson Decker, on "Health, as it is affected by Plumbing, Heating and Ventilating." Size 6-in. x 9-in. Pp. 87.

ENGINEERING FOUNDATION REPORT, for the year ended February 17, 1927, has been issued from its headquarters in the Engineering Societies Building, New York. One of the most interesting developments of the year was the gift by Edward Dean Adams of a fund of $100,000, the income from which is to be divided equally between Engineering Foundation and Engineering Societies' Library. The only investigation of particular interest to heating men is a study of the properties of steam, "for the purpose of extending the steam table.

New Apparatus and Appliances

Johns-Manville Announces Radiator Control Valve

ANNOUNCEMENT is made by Johns-Manville Corporation, New York, of the Johns-Manville radiator control valve, for controlling radiator temperatures and thereby obtaining, with steam, the desirable effects secured with water heating systems. The principle involved in the design of the valve, it will be recalled, was the subject of a paper by Foskett Brown, of Nashville, Tenn., presented at last summer's meeting of the A.S.H. & V.E. in Lexington, Ky., under the title of "Humid Air as a Heating Medium." This paper was presented in abstract in THE HEATING AND VENTILATING MAGAZINE, for June, 1926.

As perfected, the Johns-Manville radiator control valve is intended not only to give positive control or regulation of radiator temperatures, but to cause complete circulation of the heating medium and uniform distribution of temperature over the entire surface of the radiator. It is for use in vacuum and atmospheric return-line systems of heating.

The valve is of brass and bronze, with nickle-plated body, and has the desirable feature of quick opening and closing, varying from tight closed to full open in a seven-eighths turn of the control handle. Its construction features are shown in Fig. 2. Referring to the illustration, A and B designate the disc and seat of the valve and C is the sleeve with a slot, D, in it.

When the spindle is raised, the slot D is gradually exposed, allowing an increasing amount of steam to flow through it until it has reached a certain point, after which the entire seat is exposed, allowing a full opening of the valve and the maximum amount of steam to flow through it.

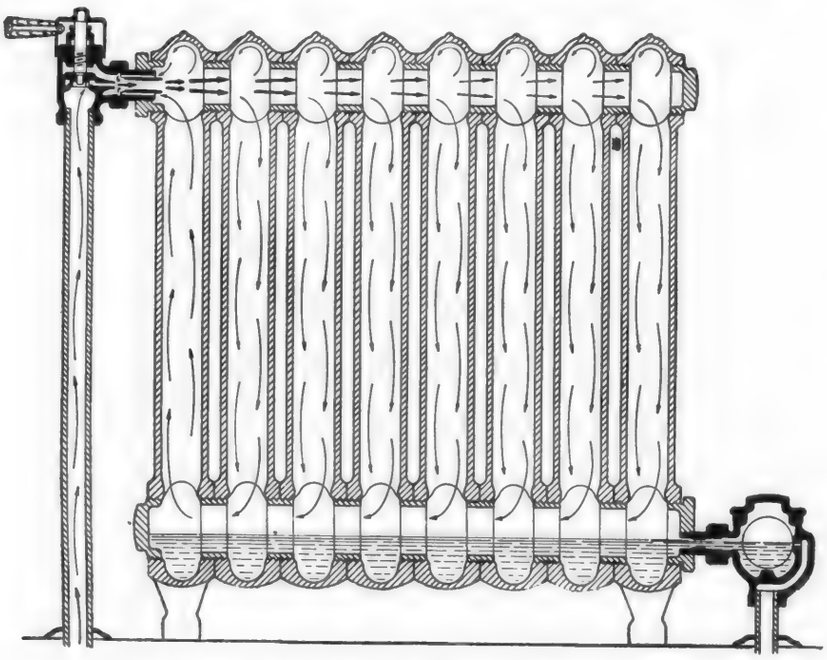


Fig. 1 Circulation of Steam and Air or Humid Mixture in Radiator Equipped with the Johns-Manville Radiator Control Valve

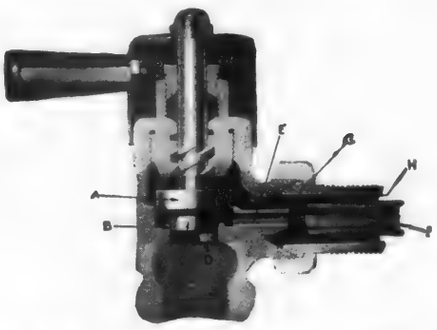
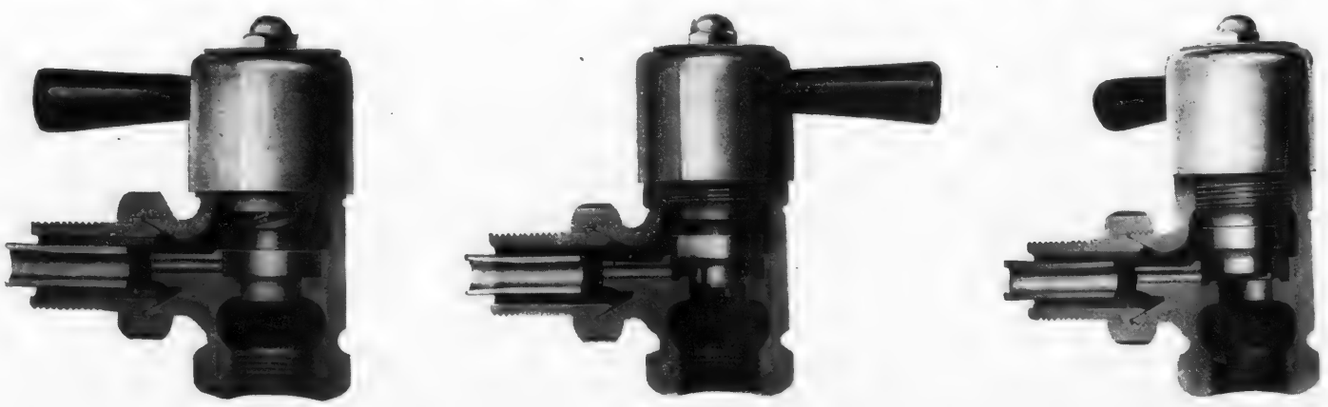


Fig. 2. Component Parts of Johns-Manville Radiator Control Valve

Before the slot D is fully exposed, the steam passes through it into the nozzle E and through the Venturi tube F. This flow creates a vacuum at G. This vacuum causes a flow of the heating medium (air and steam) from the radiator back through H to G where, mixing with the incoming steam, it is carried back into the radiator again.

Emphasis is laid on the point that the mixture of steam and air has a temperature lower than the steam supplied, and that this temperature is dependent upon the quantity of steam admitted through the nozzle E.

When the valve is wide open, that is, after the disc or piston A has been raised entirely clear of the cylinder through which it slides, steam is permitted to enter the radiator through the large port over the nozzle E, as well as through the nozzle E. This, it is pointed out, provides a means of filling the radiator with steam at full pressure at any time required as, for



Closed Half Open Open

Figs. 3, 4 and 5. Operating Positions of Johns-Manville Radiator Control Valve

example, for quick heating up in the morning or during extremely cold weather.

The mixture of steam and air flowing into the radiator through the Venturi tube F drives along through the upper connecting nipples of the radiator, passes down through the sections of the radiator and back through the lower connecting radiator nipples, finally up through the first section and back to the inlet connection, where it is again drawn into the valve around the Venturi tube at H and recirculated.

The valve is furnished in three sizes, for radiators up to 20 sq. ft. heating surface, for radiators with heating surface from 20 sq. ft. to 60 sq. ft., and for radiators with heating surface above 60 sq. ft.

Reznor Develops Warm-Air Gas Heater

An illustration of the recent rapid advances in the development of gas-fired space-heating appliances is to be seen in the design of the Reznor warm-air gas heater, recently placed on the market by the Reznor Mfg. Co., Mercer, Pa. The fact that this company has a record of forty years' activity in the development and manufacture of portable and fireplace gas heaters lends interest to its decision to enter the house-heater field.

The heater is made up of several units, enclosed in a sheet-metal casing, lined with cellular asbestos. Air enters the heater through screened openings on three sides and flows upward, around and between the heating units and thence out at the top.

A single piece of cast-iron comprises the heater unit. The few joints necessary at points where the units are closed, as on ends of combustion and vent chambers, are all closed with asbestos packing.

To take care of expansion and contraction, the vertical flues are made wider than the combustion and vent chambers, and have round edges, forming an accordion construction. Two cast-iron rails support the units, held apart by bolt spacers. The rails are bolted to the structural base angles. By having the front feet of the units rest in a channel on the supporting rail and the rear feet on a plain, flat rail, the units are confined individually to a fixed position and, at the same time, are free to expand lengthwise. The heating units are not fastened to the casing at any point.

The design splits the gases into thin streams and a corresponding splitting of the air to be heated, giving the effect of a larger amount of heating surface. On this account, it has been possible to eliminate ribs or fins.

Means are provided to remove soot by constructing each heating unit with a cover plate, at the front end of the vent chamber. Opposite these plates is a large opening in the casing, closed with a cast-iron plate, as is shown in Fig. 1. A special brush cleaner will readily remove soot from the vent chamber and the vertical flues.

Fig. 1. Reznor Warm-Gas Heater

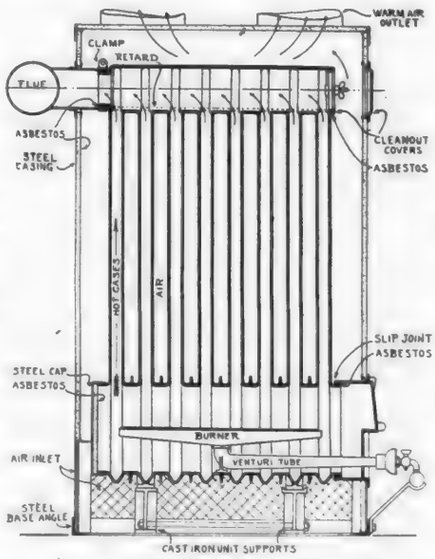


Fig. 2. Arrangement of Gas and Air Passages, Reznor Gas Heater

Sheet-steel is used for the casing, with electrically-welded corner angles. The Reznor "Super" burner, with which the heater is equipped, is one developed especially for this purpose. It is designed for use with 3-in. gas pressure. Each unit has a separate burner and pilot and is a complete heater, independent of other units.

A unique method has been evolved for supplying humidity with the heater. A brass or copper pipe is set into the hot gas flue. Water from the house supply is allowed to drip into a funnel connected to this pipe. The resulting water vapor is discharged into the volume of warm air ascending into the house. By setting the amount of drip by a pet cock, no moisture can be produced beyond that setting.

The heater is being made in five sizes, with heated space ratings from 6000 to 9000 cu. ft. to from 35,000 to 45,000 cu. ft. The corresponding B.T.U. ratings are 50,000 100,000, 150,000, 200,000 and 250,000 B.T.U. per hour.

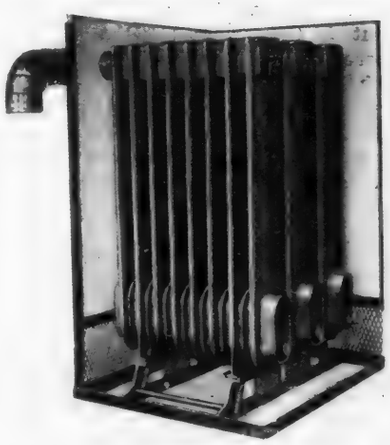


Fig. 3. Construction of Reznor Heater, Showing Cast-Iron Heater Units

Robras Twenty-Twenty

A brass radiator 20% the weight and 20% the size of an equivalent cast-iron radiator, is the interesting description given the new product of the Rome Brass Radiator Corp., 1 East 42nd St., New York. Robras Twenty-Twenty, which has been undergoing development during the past six years, is made of welded brass. The method, which is patented, is what makes such a small-sized brass radiator possible. To test such a weld, two flat pieces of brass were welded together and a brass nipple screwed into one of them. Hydrostatic pressure was released through this nipple. This water pressure, finding its way between the plates, swelled them. The brass bent under the pressure but the weld held. When the pressure reached 1250 lbs., the brass itself stretched but the weld still held.

Reduction in the size was accomplished by attaching to each side of the column a number of thin brass fins. It

Robras Twenty-Twenty Welded Brass Radiator Alongside Cast-Iron Radiator of Equivalent Surface

was found that the fins were more efficient if they were shorter in length. Therefore, the sections were made up with their long dimensions parallel to the floor.

In making up the radiator sections a shouldered nipple is screwed onto the spacer attached to one of the sections and the shouldered nipple of another section is screwed into this spacer. Thus, as many sections may be used as necessary. A special internal wrench screws the next spreader into this nut.

Besides being especially suitable for installation in wall spaces, the radiator may be enclosed in any commercial cabinet which may extend not more than 3 in. out from the wall, and 20 in. high. One suggestion in the way of a radiator cabinet shape is that of a sea chest or an old brass-bound trunk. A special bathroom type is furnished 18 in. wide and 8 in. high.

Peerless Develops Line of Unit Heaters

To supplement its line of PeerVent unit ventilators, the Peerless Unit Ventilation Co., Long Island City, N. Y., announces the Peerless unit heaters,

Arrangement of Peerless Unit Heater for Floor Mounting

Fan Design and Copper Heater Element of Peerless Unit Heater

designed for heating factories, mills, garages and other industrial buildings. These heaters are made in both the suspended type and floor type. The unit includes a special copper radiator, a fan and a small electric motor. Where special provision is desired for ventilation, the heaters are supplied with boxes or ducts for bringing in the air from out-doors, a mixing damper for regulating the flow of incoming fresh air and other needed equipment.

Special emphasis is laid on the fact that the motor and fan bearings are not placed within the heated area, in this way obviating the likelihood of lubrication troubles due to excessive heat.

Referring to the relative merits of suspended or floor types of unit heaters, the company states:

"There has been much discussion in the trade journals on the merits of various types of unit heaters. This company, after thirteen years' experience with heating and ventilation units, believes that everything depends upon the particular job in hand. It is impossible to state which is better, the suspended type or the floor type of unit, any more than it is possible to say whether a high building is better than a low building.

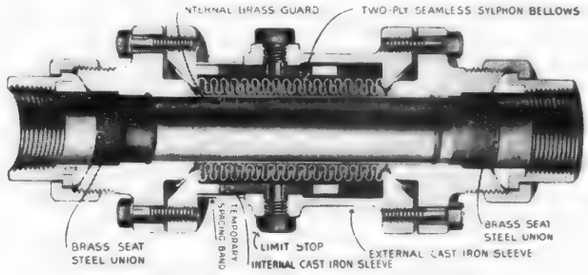
"Peerless units are made both ways. If the heating contractor prefers, this company will gladly furnish data which will enable him to make up floor-type units on the job, simply constructing a sheet metal duct with the standard Peerless heating unit at the top.

"This company's position is the same as regards high-velocity and low-velocity heaters. It all depends upon the requirements, and either type or a medium speed can be furnished."

The suspended units are made in three sizes, 30-in., 24-in. and 18-in., with corresponding capacities, ranging from 685,000 B.T.U. per hour, for the largest size, to a maximum of 158,500 B.T.U. per hour for the smallest size. The floor type is made with single and double-fan equipment for discharge in one direction or in two opposite directions.

Packless Expansion Joint for Steam Heating Risers

In these days of high building costs, when the depth of fill above floor arches is reduced, hung ceilings are a rarity,



Sylphon Packless Expansion Joint

and when, in many buildings, the bottom of the floor arch is so near the window heads that any sort of ceiling pocket or false beam to conceal expansion loops is out of the question, special interest attaches to such a device as the Sylphon packless expansion joint, which has been brought out by the Fulton Co., Knoxville, Tenn. It is intended for steam pressures under 15 lbs.

In addition to its compactness, the manufacturers emphasize its steam-tight feature, made possible through the use of the Sylphon bellows. The outer end of each cylinder is provided with a standard pressed-steel, brass-seat ground union for connection with the riser above and below. Seven sizes of the joint are supplied, ranging from ¾-in., using 1-in. joint fitting with face bushings, to 3-in.

New Trade Publications

Wanted—Standard Catalog Sizes

EDITOR HEATING AND VENTILATING MAGAZINE:

I recently sent out notices to the various manufacturers of heating and ventilating apparatus that this firm had changed from consulting sanitary engineers to general consulting engineers. The notice stated that we were contemplating practicing all forms of engineering, including heating and ventilating, and requested catalogs and other information which might be available to our mutual interests which they would like us to have.

It was a distressing sight when these catalogs arrived and were piled on my desk for distribution and filing. They were all shapes and sizes and some were bound carefully and of the right size, while most of the catalogs and folders were of such sizes and shapes that it was almost impossible to file them for use.

We received several catalogs with the American Institute of Architects listing which were of a uniform size, and they fit in the regular steel file drawer. Needless to say, these were filed away at once, and use will be made of the apparatus in specifications, but three-fourths of the balance will be lost and never seen again, especially the catalogs of new apparatus and smaller companies, and although the apparatus may be just the thing we would like to use, an engineer or specification writer does not have time to root down at the bottom of the files nor has he files or room enough to keep these odd catalogs on top.

I hope the president or manufacturer of every manufacturing concern sees this article and checks up on his catalogs to see if they are uniform with the American Institute of Architects' size. Surely these manufacturing concerns have catalog files of their own from which to take a lesson.

The sooner a standard size of catalogs is adopted, the better it will be for all architects, engineers and contractors.

WM. C. GROENIGER & ASSOCIATES,
S. B. Shearer, In Charge of
Heating and Ventilating.
Columbus, O.

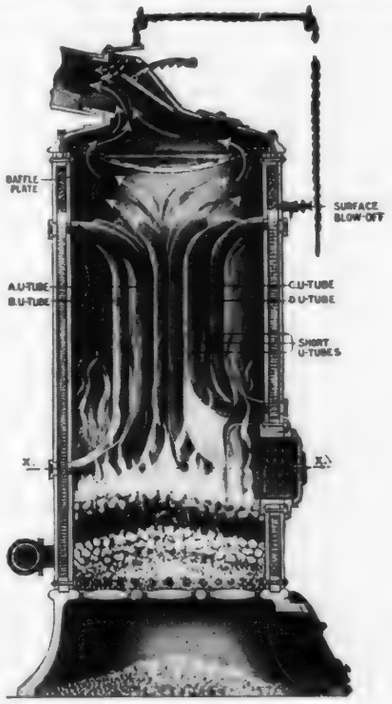
THE TEST LOG, issued by the Frost Research Laboratory, The Curren Arcade, Norristown, Pa., is published in the form of a periodical. It records the way a typical boiler test was carried out and how the results obtained on one particular boiler type enabled the manufacturer to analyze a trouble job and quickly to effect a remedy, at a saving of $1500.

STANWOOD SMOKELESS BOILERS for heating and power are presented in a series of bulletins which make up the company's 1927 Stanwood catalog, issued by the Stanwood Corp., Cincinnati, O. Bulletin 500 of the series is devoted to the design and construction of these boilers as specified for power and heating, with a note that they are built regularly for 15 lbs., 100 lbs., 125 lbs., and 150 lbs. working pressure. The capacities vary from 29 to 250 H. P., with corresponding ratings of 3500 to 31,000 sq. ft. of steam radiation. Supplementary bulletins take up in detail the different designs, with full data, including dimensions and space requirements for installation. Size 8-in. x 10-in. Pp. 24.

MAJESTIC RADIATOR CABINETS are featured in a folder issued by the Majestic Cabinet Works, 1455 Park Ave., New York. These cabinets are unique in having tops of 5-ply veneer of differently-grained wood, cemented together so as to be unaffected by any change of temperature or moisture. They also are described as providing a strong window seat.

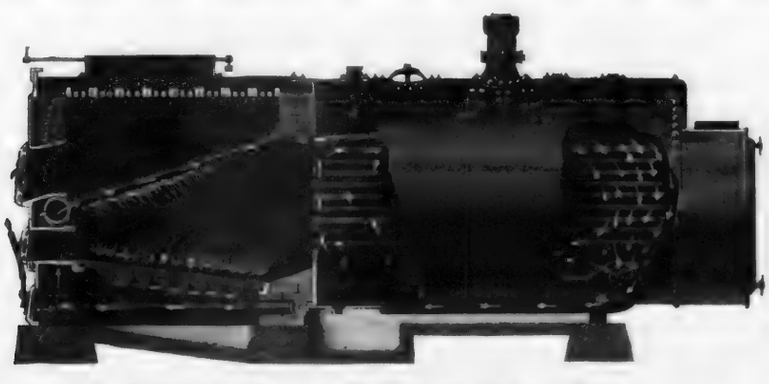
AN INSULATION ACHIEVEMENT is the title of a circular issued by The Insulating Products Corp., New York, which is devoted to Weber's No. 48 insulating cement, designed especially for use in connection with high-temperature work.

MONITOR STEEL BOILERS of the water-tube type, designed to be equally adaptable to coal, gas and oil, are presented in a circular issued by The Monitor Bi-Loop Radiator Co., Lancaster, Pa. The fact that these boilers have no flues is emphasized, as well as their construction with suspended water tubes, arranged so as to offer no resistance to expansion or contraction. The Monitor U-tube boiler, it is stated, supersedes the former Monitor boiler of wrought-iron coil construction. It is furnished in a full series, with ratings from 550 to 5400 sq. ft. of steam radiation and corresponding ratings for water radiation. A supplementary circular shows an installation of Monitor U-tube boilers connected in battery formation for heating a large building containing 5100 sq. ft. of direct vapor radiation.



Suspended Water-Tube Construction of Monitor Steel Boiler

CHAMBERLIN DETAILS FOR WOOD SASH AND DOORS, designed to give the architect complete information on standard methods of equipping windows and doors with Chamberlin metal weather strips, is a well-designed and useful publication issued by the Chamberlin Metal Weather Strip Co., Detroit, Mich. After describing the various types of Chamberlin equipment, their adaptation and selection, the manual takes up, in order, calking with Chamberlin plasti-calk for use against outside windows and door frames, Chamberlin equipment for double-hung windows, for in-opening casement windows, for out-opening casement windows, for austral windows, for outside transom windows, for outside doors, and In-dor-seal as applied to interior doors. In each case complete



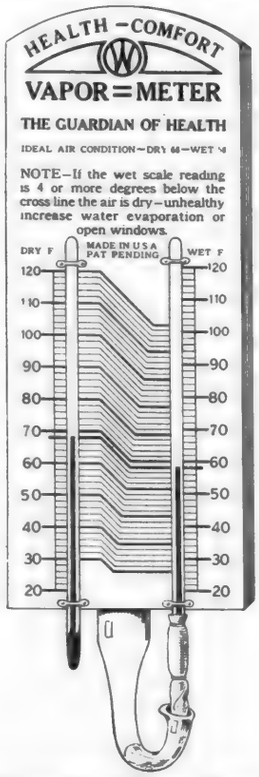
Gas Travel Through Stanwood Smokeless Boiler

specifications are given. The illustrations include full-size details, with weather-strip gauges. The cover is properly printed and punched for ready filing. Size 8½ in. x 11 in. (standard). Pp. 50. (A.I.A. File No. 19e14).

WALTERS ADJUSTABLE RADIATOR HANGER, described as a modern hanger for the modern heating engineer, is featured in circular matter issued by the Walters Mfg. Co., Lancaster, Pa. The hanger is made up of steel parts so that it has no casting. It is described as adaptable to all types of building construction and to all makes of radiators.

QUIGLEY TRIPLE-A SOLUTIONS in the form of protective coatings in black and colors to prevent corrosion of iron, steel and other metals, are featured in a circular issued by the Quigley Furnace Specialties Co., Inc., 26 Cortlandt St., New York.

WACKENHUTH VAPOR-METER is described in a folder issued by Frederick Wackenhuth, 97 Lafayette St., Newark, N. J. It consists of a dry and wet bulb


HEALTH — COMFORT
VAPOR = METER
THE GUARDIAN OF HEALTH
NOTE—If the wet scale reading is 4 or more degrees below the cross line the air is dry—unhealthy increase water evaporation or open windows.
MADE IN U.S.A.
PAT. PENDING
DRY F
WET F

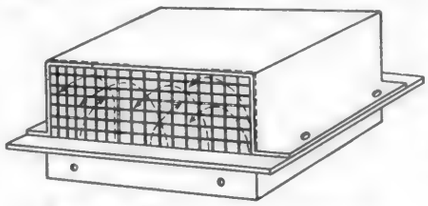
Wackenhuth Vapor Meter

with directions for determining, from the readings, the condition of heat and humidity from the air. It is listed at $2.50.

OIL BURNER FURNISHES DOMESTIC HOT WATER, TOO, issued by the Thermal Appliance Co., 342 Madison Ave., New York, tells an interesting story, with diagrams, of a summer and winter combination using an oil-burning steam boiler, Mercoid controls and Taco semi-indirect water heater for hot water supply, with the control, in one case, from the boiler water and, in the other, from the tank. The diagrams show each hook-up in detail.

THERMAINO is the subject of a new circular, issued by the Hart & Cooley Mfg. Co., New Britain, Conn., devoted to its new models of Thermaino heat cabinets. These cabinets are furnished in mahogany or walnut grain, ivory, white, or any color to harmonize with the interior. The top is made to be readily raised for filling a humidifier if one is used. Invisible doors on the ends permit access to the valves. The top is insulated with asbestos lining. Special attention is directed to the back of the cabinet which permits installation to be made close to the wall.

TU-WAY AIR DEFLECTOR (double size) is illustrated and described in a circular issued by the Knowles Mushroom Ventilator Co., 202 Franklin St., New York. This ventilator has a fixed height from 2-in. to 6-in. The smaller sizes can be used on the inclined section of an orchestra floor without interference with backs of chair seats when they are

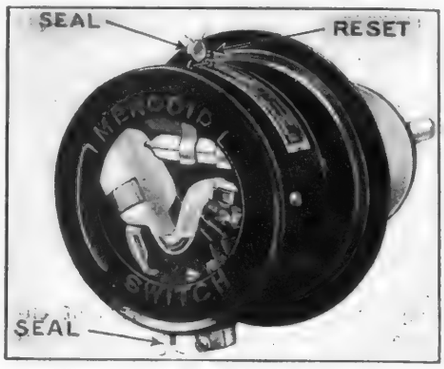


Knowles Tu-Way Air Deflector

raised. The larger sizes provide, on a level floor, an air-controlling device with comparatively large area. This deflector is made of cast-iron and is furnished with or without regulating damper. The openings are covered with heavy wire screen, locked into grooves.

MERCOIDS for April, 1927, the monthly periodical of the Federal Gauge Co., Chicago, contains as its leading article a discussion of stack safety problems, by I. E. McCabe, the company's chief engineer. After calling attention to the tendency on the part of oil-burner manufacturers to locate the final oil-burner safety device in the stack, Mr. McCabe goes on to tell of the many unstable conditions which are encountered with various types of burners, as well as the varying conditions arising from their installation in different types of furnaces, the fuel used, the draft conditions and the source of current. As these devices must operate on either a rise or fall in temperature, and as it is necessary to allow for variations during operation, these devices are arranged for differentials between operations so that before any change is made in the circuit, a considerable rise or fall in temperature must occur.

The company's first experimental instruments were made with approxi-



Mercoid Type SA Stack Safety Control

mately a 60° F. operating differential. However, it was found that these were too sensitive for the higher stack temperatures, but not sensitive enough for stacks with lower temperatures. It became evident, that a satisfactory device should have an operating differential that increased with the rise in temperature and decreased with the fall in temperature. It was also realized that means should be provided for increasing or decreasing the differential when required.

Mr. McCabe then presents interesting details of the steps which led to the development of the Mercoid Type SA safety, the adoption of Pyrex glass in its construction and the use of a hermetically-sealed container for holding inert gases and mercury. Mr. McCabe also refers to the adjustable universal time feature embodied in the Mercoid Type SA control.

NIAGARA ELECTRIC STEAM RADIATORS AND AIR HEATERS is the designation of Bulletin No. 30, issued by the Buffalo Gas Radiator Corp., North Tonawanda, N. Y. The bulletin includes a table of sizes and capacities of both radiators and air heaters. While ratings on this equipment are quoted in "watts used" a note in the pamphlet states that one watt hour equals 3.412 B.T.U. per hour.

Niagara Electric Steam Radiator

Figures are also included to cover the number of watts to be allowed per cubic foot of air space, per square foot of exposed wall and per square foot of exposed glass. Size 8½ in. x 11 in. Pp. 4.

Present Accepted Practice in Domestic Oil Burners

Northern. *Vaporizing, Natural Draft, Gas-Pilot Ignition*

Previous articles in this series are:

1. *Kleen Heet, July*, 1925.
2. *Baker, July*, 1925.
3. *Kerrihard, July*, 1925.
4. *Silent Glow, August*, 1925.
5. *Aetna, August*, 1925.
6. *Caloroil, September*, 1925.
7. *Oil-O-Matic, September*, 1925.
8. *Chalmers, October*, 1925.
9. *Hart, October*, 1925.
10. *Sun, October*, 1925.
11. *Rayfield, November*, 1925.
12. *A. B. C., November*, 1925.
13. *Electrol, December*, 1925.
14. *Grant, January*, 1926.
15. *Nu-Way, January*, 1926.
16. *Wayne, February*, 1926.
17. *May, February*, 1926.
18. *Ray Rotary, March*, 1926.
19. *Super Oil Heator, May*, 1926.
20. *Nokol, July*, 1926.
21. *Johnson, August*, 1926.
22. *Arrow, September*, 1926.
23. *Safe Fire, October*, 1926.
24. *Sword, November*, 1926.
25. *Hardinge, January*, 1927.
26. *Petro, February*, 1927.
27. *Sundstrand, March*, 1927.

28. Northern

THE Northern oil burner is unique among natural draft burners in that it operates with a gas pilot, instead of the customary high and low flame, and in that means are provided for the regulation, within a fairly close margin, of the amount of air passing through the burner. This burner has been in use for a number of years, but only during the last two years has it been manufactured and sold by the Northern Machinery Company, Minneapolis, Minn.

OPERATION OF THE BURNER

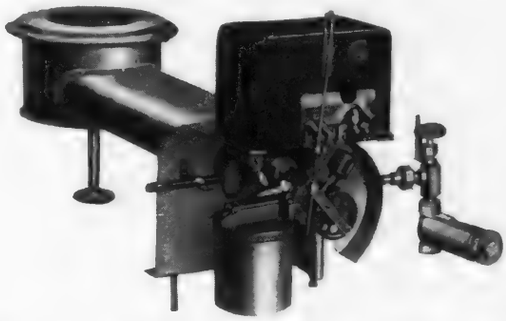
Oil is fed to the burner by gravity through an equalizing valve at the tank from an elevated tank of a size approved by the Underwriters and local regulations. The oil enters the burner through a strainer, thence through a needle valve which controls the exact amount of oil flowing into the pot. From the needle valve the oil passes through a diaphram valve (Imperial, Type H) operated by the thermostat motor. The oil actually enters the pot through a ¼-in. pipe which goes through the air sleeve. This pipe delivers the oil at a point just under the small Bunsen-type gas pilot where the hot spot in the bottom of the pot immediately vaporizes it. This vapor ignites and the flame slowly builds up as the draft increases to its regular flow.

The pot is in reality double. The outer pot is solid and the inner pot has a slightly concave bottom, where the oil is vaporized, and perforated sides. The air, pulled through the air sleeve from the basement, enters the pot through these numerous openings. This method of admitting air gives a thorough mixture of vaporized oil and air and permits an efficient flame without any noticeable combustion noise. The flame reaches its normal operating size within a minute from starting and is then burning in suspension from a point about 1-in. below the top ring of the pot. The pot is protected from actual contact with the flame by the air entering the many small openings and through a ring near the top of the pot.

Because of the fact that natural draft is used, there is no great rush of air through the burner, and no violent expansion of the gases upon ignition. This allows the use of a very small gas flame for a pilot. The amount of gas used is further reduced by an air mixing chamber so that a true Bunsen flame is the result.

The draft is controlled by a balanced damper cut into the smoke pipe between the furnace and the chimney. This damper is regulated on a day when the draft is about normal or slightly sluggish, so that the door will flutter slightly when the burner is operating. When the chimney draft increases, due to atmospheric conditions, any excess of air will be drawn into the chimney through the damper instead of through the burner, due to the fact that the damper is closest to the chimney and offers the path of least resistance. This feature is important in that it assures an even fire at all times without waste of oil due to excess air.

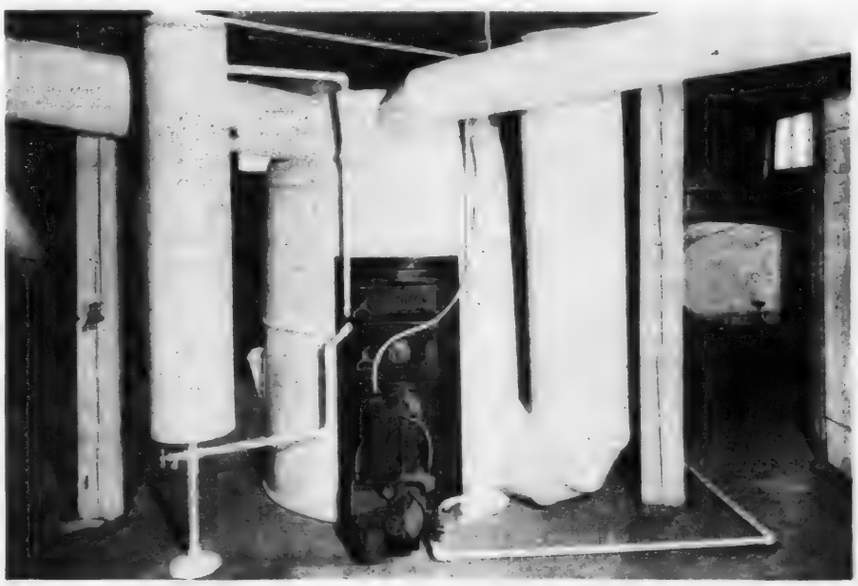
The safety mechanism is simple. In the event that the pilot goes out, oil entering the pot will not vaporize but accumulate. It then flows back through a ¾-in. pipe through the air sleeve to the metal bucket at the side of the diaphram valve. As the oil fills this bucket, a float raises and when about half way up, this float releases a weighted lever which falls and closes the diaphram valve, thereby stopping all flow of oil. The burner cannot be operated again until the bucket has been emptied and weighted lever put in its proper position. The overflow pipe is protected within the pot so that any accumulation of any sort within the pot cannot clog the pipe and prevent proper functioning of the safety mechanism.



Northern Oil Burner Showing "High-Low" Valve and Control Motor

APPLICATION OF THE BURNER

The Northern burner is designed especially for the average home and at a price the average man can afford to pay. It cannot be overloaded successfully. It



An Attractive Installation of a Northern Oil Burner

operates best in round furnaces of 25 in. or less in diameter, will handle 350-450 sq. ft. of steam radiation, 550-700 sq. ft. of hot water and nine or ten rooms with warm air. If kept within these limits, it is capable of developing a high degree of combustion and eliminates noise and cost of motor operation.

The Northern is ideal for warm air, pipeless or otherwise, for two or three reasons. First, the flame is silent. It is secondly, a non-mechanical burner and hence, there is no vibration to be transmitted to the rooms above by the casing of the furnace. Last, and most important, being a natural draft burner, it maintains a partial vacuum within the furnace. In warm air furnaces of the cast-iron type, where the combustion chamber is built up, the cement between the sections frequently comes loose. An atmospheric burner will pull air in through these cracks and toward the chimney whereas a mechanical-draft burner tends to force combustion gases out through them and thence to the rooms above through the air ducts. This

Northern Oil Burner Showing Blast-Tube and Fire Pot

can be shown by holding a lighted candle or a match to any opening into combustion chambers.

EQUIPMENT AND INSTALLATION

Standard installations of the Northern burner are made with a view of bringing the burner within the reach of the average small home owner. A Minneapolis plain thermostat is furnished and a Minneapolis spring-wound motor is built into the burner. This requires winding about twice a week. However, an electric wind motor can be furnished at a slight additional cost. Standard tankage is a 275 gal. basement unit, but again, an underground tank with an automatic pump along the lines of a Cook, type H, Teasdale, or a Milwaukee tank unit can be installed.

The Northern is listed as standard by the Underwriters for automatic control with gas pilot, to burn distillate not heavier than 38° A.P.I. and to operate on a draft of not less than 0.007 in. water column. It is, at this time, the only natural draft burner listed for automatic control.

Heating Equipment Features Chicago's "Own-Your-Home" Show

THE heating industry was exceptionally well represented at the Chicago Own-Your-Home Exposition, held April 2-9, at the Coliseum. Attendance records were broken and exhibitors detected a keen interest on the part of the public in the exposition.

The Peoples Gas Light & Coke Company exhibited the Bryant gas boiler, Clow Gasteam radiators and the Columbus gas furnace. A. H. Wolff Gas Radiator Company displayed the Ideal gas boiler, Minneapolis heat regulators and Scientific garage heaters. The gas industry was also represented by exhibits of the American Gas Products Company, the Bryant Heater & Mfg. Company and the Heatomat Gas Boiler Company.

Oil burners were well represented, those on display including the Aladdin, Ballard, Berryman, Franklin, Pascoe, Silent Automatic and Sundstrand.

A two-story fireproofed and insulated frame house, in model form, was shown by the United States Gypsum Company. Other insulations effectively displayed were Balsam wool, Celotex, Insulex, Insulite, Hydrostone, Johns-Manville, Masonite and Union Fibre. Additional heat-conserving exhibits were the Chamberlin metal weather strip, the Basely strip and the Sager strip.

American Radiator Company showed its Ideal boilers and Corto radiators; the C. A. Dunham Company, the Dunham steam heating specialties, and the Minneapolis Heat Regulator Company, Minneapolis controls.

Something new in the way of an electrically-heated cabinet radiator was shown by Schleicher, Inc., Chicago, and there were also on display several warm-air furnaces and the Heato furnace booster.

On Friday, "Equipping the Home Day," four lectures on heating subjects were delivered in the exposition lecture hall. "Temperature Regulation in the Home" was presented by G. H. Blanding, "Heating Systems for the Home," by Macy Good, and G. C. Carnahan read his paper on "House Heating by Gas."

A talk on "Building Insulation" was broadcast by Chester D. Freeze, April 8, from Station KYW.

AIR CONDITIONING AND REFRIGERATION IN THE BAKERY is the subject of Bulletin 625, issued by The Cooling and Air Conditioning Corporation, New York. The text of this bulletin presents a very interesting story of the value of air conditioning to the baking industry and the pictures bring out the salient points of installations made by this organization. A feature of this equipment is the design of the built-in ducts for proof boxes; they are built integral with the box, obviating the projection of parts into the room. The story told in this bulletin is an indication of the rapidly developing application of "artificial atmosphere" to the industries. Size 6 in. x 9 in. Pp. 24.

GRINNELL ADJUSTABLE PIPE HANGERS AND SUPPORTS (Catalog No. 4), issued by the Grinnell Co., Providence, R. I., is characterized as more than a catalog inasmuch as it contains mechanical drawings and dimension tables on practically every item. This helps to make the catalog a reference and data book for engineers and contractors working on specifications. The hangers are described as the outgrowth of more than 70 years' experience in industrial piping. Size 5 in. x 7 in. Pp. 92.

STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACT OF CONGRESS OF AUGUST 24, 1912, OF THE HEATING AND VENTILATING MAGAZINE, published monthly at New York, N. Y., for April 1, 1927.

State of New Jersey, County of Essex, ss.:

Before me, a notary public in and for the State aforesaid, personally appeared Arthur S. Armagnac, who, having been duly sworn, according to law, deposes and says that he is the editor of The Heating and Ventilating Magazine, and that the following is, to the best of his knowledge and belief, a true statement of said publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in Section 443 Postal Laws and Regulations printed on the reverse of this form to wit:

1. That the names and addresses of the publishers, editor, managing editor, and business managers are:

Publisher, Heating and Ventilating Magazine Co., 1123 Broadway, New York.

Editor, Arthur S. Armagnac, 1123 Broadway, New York.

Managing Editor, None.

Business Manager, Gustave Petersen, 1123 Broadway, New York.

2. That the owners are: (Give names and addresses of individual owners, or if a corporation, give its name and the name and address of stockholders owning or holding 1 per cent or more of the total amount of stock).

Heating and Ventilating Magazine Co., 1123 Broadway, New York.

Arthur S. Armagnac, 1123 Broadway, New York.

Gustave Petersen, 1123 Broadway, New York.

3. That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more or total amount of bonds, mortgages, or other securities are: None.

4. That the two paragraphs next above giving the names of the owners, stockholders, and security holders, if any, contain, not only the list of stockholders and security holders as they appear upon the books of the company, but also in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustee, hold stock and securities in a capacity other than of a bonafide owner and this affiant has no reason to believe that any other person, association or corporation has any interest direct or indirect in the said stock, bonds or other securities than as so stated by him.

ARTHUR S. ARMAGNAC, Editor.

Sworn to and subscribed before me this 29th day of March, 1927.

ERNEST M. MARSHALL,
Notary Public, of New Jersey.
(My commission expires June 12th, 1927.)

Trade and Miscellaneous Notes

Coming Events

May 9-12, 1927. Thirty-first annual meeting of the National Fire Protection Association in Chicago, Ill. Headquarters at the Congress Hotel.

May 17-20, 1927. Eighteenth annual convention of National District Heating Association in West Baden, Ind. Headquarters at the West Baden Springs Hotel.

May 23-26, 1927. Spring meeting of American Society of Mechanical Engineers in White Sulphur Springs, W. Va. Headquarters at The Greenbrier.

June 1-4, 1927. Thirty-eighth annual convention of the Heating and Piping Contractors National Association in West Baden, Ind. Headquarters at the West Baden Springs Hotel.

June 28-30, 1927. Semi-annual meeting of the American Society of Heating and Ventilating Engineers, at White Sulphur Springs, W. Va.

Miscellaneous Notes

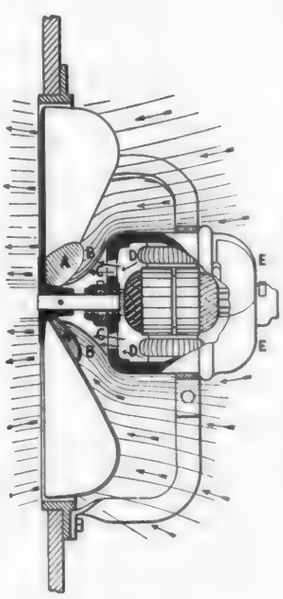
C. E. A. Nutting, of the Illinois Plumbing and Heating Co., Rock Island, Ill., and a member of the Rock Island Master Plumbers' Association, has been appointed to serve on the special committee of State President C. D. Harris, on heating insulation research work. This committee will work with a committee representing the manufacturers of insulating materials in an effort to work out certain theories and solve some of the problems of heating contractors. The committee also includes Homer Linn, American Radiator Company; Prof. A. C. Krantz, University of Illinois; William Hitchcock, of Peoria, and Austin Pope of Chicago.

American Gas Association is now providing a loose-leaf leather binder for the list of gas appliances that have been approved by the Testing Laboratory, Cleveland, O. The binder contains a list of all appliances tested and approved as of February 1, 1927; additional sheets containing later approvals will be issued monthly. Copies of this list can be obtained from R. M. Conner, director of the laboratory, foot of East 62nd St., Cleveland. The price of these extra binders is $2 each, which includes the service of monthly approval sheets for one year.

President W. H. Carrier, of the American Society of Refrigerating Engineers, was the guest of the Chicago Section at a dinner in his honor at the Chicago Engineers' Club, April 19. Mr. Carrier is making a tour of the local sections of the society.

Clyde R. Place, New York, announces the removal of his consulting engineering offices from the Grand Central Terminal to the Graybar Building, Lexington Avenue and 43rd Street. Mr. Place has been the consulting engineer for the Grand Central Terminal group of buildings since 1904, and for the past fifteen years has also conducted an extensive independent practice.

Mechanical Co-Operative Association is the name of a new organization of heating contractors in Baltimore, Md., which is affiliated with the Heating and Piping Contractors National Association. The membership, which takes in the larger heating and power piping contractors, consists of about 90% of the firms in the Baltimore area. Officers elected are: President, George Bullen, Enterprise Steam Heating Co.; vice-president, Charles King, Charles T. King & Co.; treasurer, Lester McCrea,



Patented

Protecting the Motor

TESTS show that passage of a current of air through the motor causes corrosion and contamination of motor windings.

Autovent Fan Motors are definitely insured against contamination because the front end is securely closed (E) by removable inspection covers.

The radiation cooling feature is accomplished by patented **Centripetal Vanes** (A) on the fan wheel hub.

As the wheel spins around these vanes cause the air currents to speed up and converge at the axis, thereby carrying away the heat from the fan end of the motor (D).

A **protected** motor will always give satisfaction.

Estimates and prices cheerfully furnished by our Engineering Department.

AUTOVENT FAN & BLOWER CO.

730-738 W. Monroe St., CHICAGO

ENGINEERS IN ALL PRINCIPAL CITIES

AUTO [Automatic] VENT [Ventilation]

[GUARANTEED]

James McCrea and Son; secretary, Meyer Rosenbush, an attorney of Baltimore, located in the American Building.

Norfolk, Va.—A local unit of the Heating and Piping Contractors National Association is being organized at Norfolk, the membership consisting of heating contractors in that locality. The organization work was handled by A. R. Thompson. Member applications have been received from T. M. Rust, Craft Bros., A. L. Blanks & Co., W. W. Breedlove & Co., Coley & Petersen, R. D. Duell & Co., J. G. Lancaster, C. W. Perry, A. R. Thompson, C. L. Woodard and J. J. Shanahan.

American Gas Association, 342 Madison Ave., New York, has moved to its new offices on the fifth floor of the Graybar Building at 420 Lexington Avenue. No official "house warming" will be held by the Association, but every member is invited to visit the new headquarters.

Central Station Heating Notes

Kalamazoo, Mich. William Shakespeare, Jr., former city commissioner, is planning to submit to the city commission a new franchise proposal to construct and operate a central heating plant in Kalamazoo. A proposition previously submitted by Mr. Shakespeare was turned down. Before a meeting of the commission, Mr. Shakespeare stated that he would like to build the central heating plant, have the people make the rules and regulations, and he would pay for the plant and operate it. Charles H. Farrell, representing the Consumers' Power Company, also addressed the commission on a heating plant proposal, recently submitted, and asked for a conference with the officials of this company.

Philadelphia, Pa. Philadelphia Electric Company has awarded contract to Northeastern Piping and Construction Corp., North Tonawanda, N. Y., for the installation of the first unit of a large underground steam distribution system to serve sections of the business district of Philadelphia.

Akron, O. Contract to Northeastern Piping and Construction Corporation for installation of complete underground steam distribution system to serve the business section of Akron, to be operated by the Northern Ohio Power and Light Company through its subsidiary, the Akron Steam Heat Company.

Cedar Rapids, Ia. Iowa Railway and Light Company has given contract to Northeastern Piping and Construction Corporation for the installation of an extension to their underground steam distribution system which supplies district heating service to downtown Cedar Rapids.

Moline, Ill.—Central heating plants in Moline and Rock Island, to serve the business districts, are the object of a petition for a franchise filed with the Rock Island city clerk by the Central Steam Heat and Power Company, of Madison, Wis. The promoters declare the company may invest nearly $1,000,000 in Moline and Rock Island. A separate boiler plant would be constructed in each city. It is reported that P. W. Chapman & Company are arranging to finance the project. The form of ordinance proposed for passage in Rock Island provides that the company will furnish heating service at $1.25 per 1000 lbs. The company would give the city an option to purchase the utility at any time after it is fully completed, at a price to be determined by appraisers. Two years is named as the limit within which the company is to install the system.

Freeport, Ill.—Application for a franchise to maintain and operate a central steam heating plant for the benefit of the business section of Freeport, has been made by the Central Steam Heat and Power Company, of Madison, Wis. The cost of the plant is estimated at $500,000. A rate of $1.25 per 1000 lbs. of steam is specified.

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UNIT HEATERS

Put The Warm Air Where It Is Desired

Besides the high operating efficiency of Pecco Unit Heaters, there is an added advantage in the control and delivery of the warm air.

Pecco heaters may be equipped with outlets so that air may be delivered in as many different directions as desired. Also, outlets can be so proportioned that any given amount of heat can be delivered from any outlet.

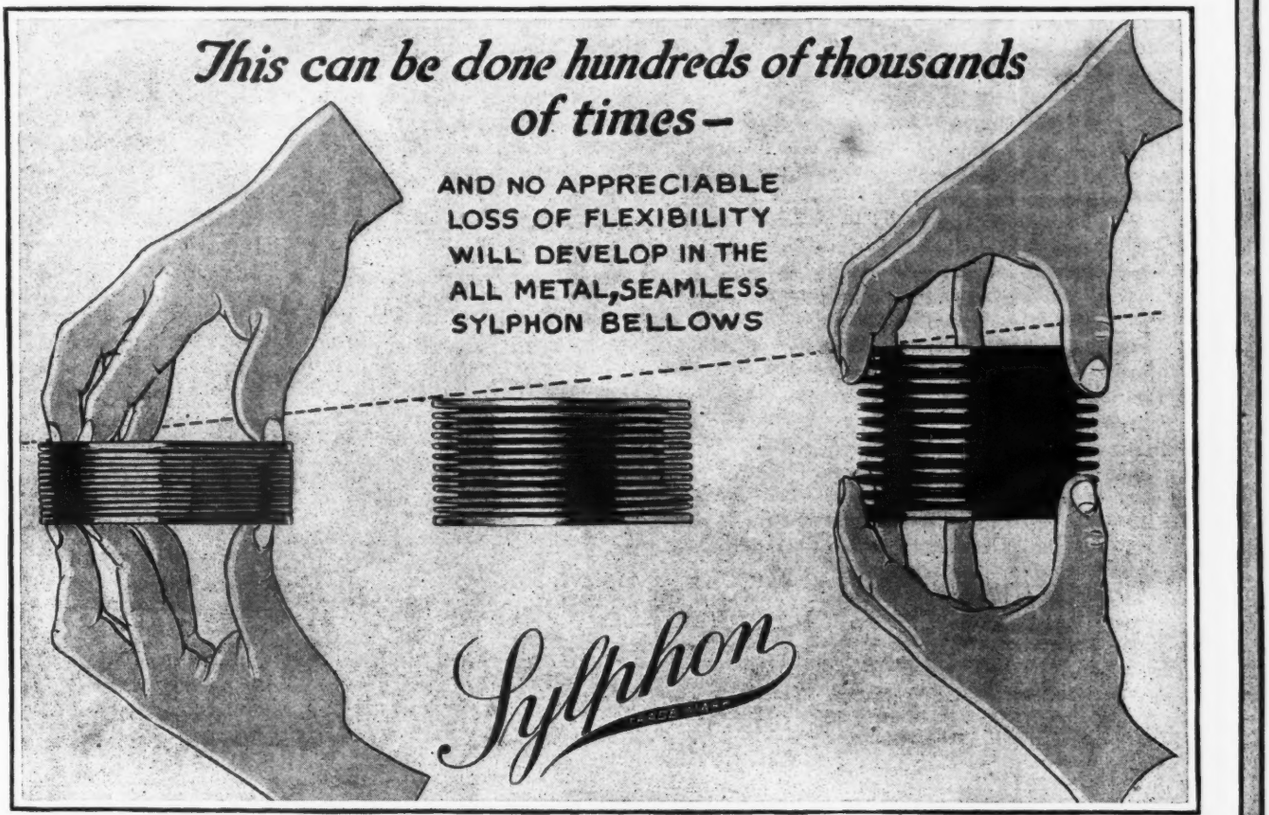
Another decided advantage is the position of the heating coils. They are in the upper part of the heaters and make it much easier to run return lines back to the boiler.

It is possible to get any degree of heat delivery up to the maximum capacity of the heater through belting connections between motor and fan. Pulleys of proper size can be furnished so that heater will deliver required amount of heat for each job.

This external view shows some Pecco Unit Heater features. Note that the cold air intake fan is located where it belongs —near the floor at the cold air level.

"Heat With Unit Heaters"

PECCO, INCORPORATED, 2980 North Market Street, St. Louis, Mo.


This can be done hundreds of thousands of times—
AND NO APPRECIABLE LOSS OF FLEXIBILITY WILL DEVELOP IN THE ALL METAL, SEAMLESS SYLPHON BELLOWS
Sylphon

Used as the diaphragm in Sylphon Damper Regulators

FOR LOW PRESSURE STEAM BOILERS

Any damper regulator, to be efficient, must have a diaphragm that will expand and contract with the slightest change in steam pressure, and be able to do so continuously for years without losing any of its flexibility. If it is made of rubber, solder or other perishable material, you know it will not long function without breakdown; because rubber rots, and solder cracks.

Sensitive, Smooth, Positive in Action and Durable.

All Sylphon Damper Regulators contain as diaphragm the genuine, all-metal Sylphon Bellows, which is drawn and formed seamless from a sheet of specially prepared metal. It is the most sensitive, flexible and yet durable expansion unit known.

Insist upon the genuine—Refuse imitations.

ASK FOR BULLETIN WDR-5.

THE FULTON COMPANY KNOXVILLE, TENN.

ORIGINATORS AND PATENTEES OF THE SYLPHON BELLOWS

SALES OFFICES IN: New York, Chicago, Detroit, Boston, Philadelphia and all the principal Cities in the U. S.

European Representatives: Crosby Valve & Engineering Co., Ltd., 41-42 Foley Street, London, W. 1, England

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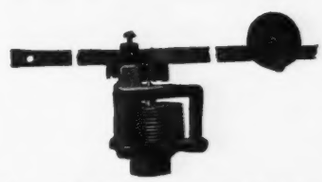
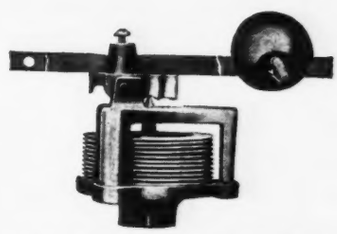
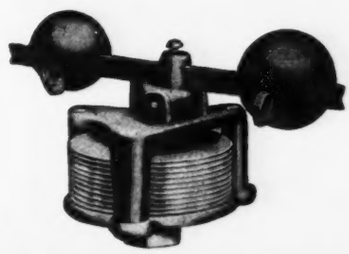


No. 22-J Sylphon Damper Regulator for low pressure steam boilers with light dampers.



No. 22 Sylphon Damper Regulator for low pressure steam boilers.



No. 924 Sylphon Steam Damper Regulator, extra sensitive type.

Manufacturers' Notes

Williams Oil-O-Matic Heating Corp., Bloomington, Ill., reports that 52 nearby Oil-O-Matic dealers attended a two-day meeting in March in the Lincoln Hotel, at Indianapolis, to study and discuss advertising and selling methods. Lawrence L. Smith, vice-president and sales manager, talked on "Selling Methods that Breed Sales." The topic discussed by R. D. Marshall, sales instructor of the Williams Institute of Heat Research, was "Taking the Slack Out of Sales Efforts." Many other topics were presented.

Similar meetings will be conducted over the country previous to the International Oil-O-Matic Convention which will be held in Bloomington, June 6-7. Arrangements are being made for an attendance of 2500 Oil-O-Matic dealers, salesmen and servicemen. Every part of the world will be represented. Mr. Dapfer, chief engineer of the Oil-O-Matic distributor in Germany, is already at the factory in Bloomington. Other countries to be represented are Great Britain, Spain, Belgium, Australia, and China. As in former conventions, special trains will be chartered to bring delegates from the eastern and western seaboards.

Consolidated Boiler Sales Company announces the appointment of George H. Snyder as district manager for the company, to be located at 7 Brooklyn Boulevard, Baltimore, Md.

Bernhard Boiler Co., Ironton, O., opened its new plant in that city when an inspection tour was made by the public, and the process of making boilers was explained to the visitors. A. L. Garford, of Cleveland, is chairman of the board of directors. Officers are: President and general manager, J. B. Bernhard; first vice-president, Carl E. Froelich; second vice-president, Charles Horn; secretary and assistant general manager, Walter L. Henry; treasurer, C. B. Egerton, and director, W. P. Lewis.

Bailey Meter Co., Cleveland, O., has been organized as a new company, and announces that it has acquired the flow meter business of the General Electric Company, and the fluid meter and combustion control business of the former Bailey Meter Company. The new company will have its factory and general offices in its newly-acquired manufacturing plant on Ivanhoe Road, in Cleveland, but at present will occupy the quarters of the former Bailey Meter Co., 2015 East 46th St. Officers of the new company are: President, E. G. Bailey; vice-president in charge of administration and finances, R. S. Coffin; vice-president in charge of engineering and sales, R. E. Woolley, who was formerly with the General Electric Co.; sales manager, H. M. Hammond, formerly sales manager of the Bailey Meter Co., assisted by D. A. O'Bannon, formerly with the General Electric Company. Branch offices will be located in all large cities.

May Oil Burner Corp., Baltimore, Md., announces the recent meeting of the May Oil Burner Corporation Dealer Council to discuss the general policies of the company for the coming year. These policies covered sales, advertising, finance and engineering.

Honeywell Heating Specialties Co., Wabash, Ind., made a clever use of its display of Honeywell motors at a recent community fair, held in Wabash, by having them operate movable signs strung around the booth. The signs were attached to chains connected to the motors, and their movement up and down gave an animated effect which added much to the attractiveness of the display. Along the eaves of the booth were strung colored electric lights which went on and off every five seconds as they were actuated by a Honeywell motor switch.

Monitor Boiler Co., 1505 Race St., Philadelphia, Pa., has opened an office and display room, for the sale of Coil boilers, at 31 East 21st St., New York, which will be in charge of S. B. Rigby.

Cascade Automatic Sprinkler Corporation announces that William K. Walker, formerly with McKenzie, Voorhees & Gmelin, has become associated with its heating and ventilating division, located at 507 Graybar Bldg., New York.

American Radiator Co., New York, announces that 1926 was its record year, topping the previous year's business and profits by a good margin. Net profit for the year was $12,476,485 available for dividends. Earnings on the $25 a share common stock were $9.65 per share; a large part of these earnings were due to European and other foreign business, European sales having been equivalent to 40% of the American business. At the close of 1926, current assets totalled $38,463,248, against current liabilities of $5,329,405, with a working capital of over $32,000,000.

Crane Co., Chicago, announces that F. L. Bridgman, after 42 years of service, recently as manager of the New York branch of the company, will be relieved of these duties but will continue in his present position of vice-president of the Crane Export Corporation. In addition he will act as supervisor of the eastern branches, and remain on the executive committee of the Trenton Potteries Company. P. R. Mork, manager at Minneapolis, has been transferred to New York as manager of that branch.

Frank A. Holby Corporation of Mass., Boston, Mass., has acquired Aetna Home Utilities Inc., 782 Commonwealth Ave., Boston, and in addition to the Aetna automatic oil burners, the Holby industrial oil-burner line, formerly known as Sunbeam, now will be sold, installed and serviced from this address. The personnel remains intact. J. T. McTarnahan is in charge of Holby industrial oil burners.

L. J. Wing Mfg. Co., New York, has appointed C. W. Diemecke as Chicago representative, with headquarters at 549 West Randolph St., to handle the Wing line of unit heaters, forced-draft blowers, fans, exhausters, small turbines, etc.

American Nokol in New Home

American Nokol Company, Chicago, has recently acquired a new factory in the northwest manufacturing district. With the present equipment and space a production of from 10,000 to 50,000 oil burners can be handled without lost motion, waste of space or idle equipment.

During the past few months, A. B. Frenier, vice-president in charge of production, and C. E. Shields, factory manager, have visited up-to-date factories so as to incorporate into their own plans the best features noted. In the new plant every machine goes through, upon the original truck, from the first stage to the final shipment.

New Factory of American Nokol Company

To get your steam from here to here

—use this efficient and economical system

AT less than half the cost of a walking tunnel, the Johns-Manville Underground System of Insulation offers you a highly efficient method of getting steam and hot water underground from one building to another.

Constructed according to the highest engineering standards, its efficiency is guaranteed to be at least 90%. It couples an efficient plant to an efficient distributing system, resulting in the maximum economy in heating service.

A book completely describing this system, including photographs and interesting data on the big 19,400 ft. installation at Cornell University, should be yours for reference. You will want this book. Send us your name and we will mail it to you.

JOHNS-MANVILLE CORPORATION, Madison Ave. at 41st St., N. Y.
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Through
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INSULATION
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ROOFINGS
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CEMENTS
FIRE PREVENTION PRODUCTS

JOHNS-MANVILLE

Underground System of Insulation

McDonnell & Miller, Wrigley Bldg., Chicago, announce that the Underwriters' Laboratories have tested, approved and listed as standard, the McDonnell & Miller duplex low water and pressure switch for oil-fired steam boiler jobs.

Fairbanks, Morse & Co., Beloit, Wis., at the annual meeting of the board of directors, elected W. S. Hovey as president of the company to succeed C. H. Morse, the former president, who was elected chairman of the board. Mr. Hovey has been connected with this company for 25 years; in 1924 being appointed general manager of the entire business, which position he will continue to hold.

Rome Brass Radiator Corp., 1 East 42nd St., New York, announces the following additions to its personnel; D. G. Noakes, formerly New Haven branch manager of the Hart & Cooley Co., Inc., and E. J. Bredehoft, formerly with W. A. Russell & Company, who has also served as first vice-president of the National Association of Plumbing and Heating Salesmen.

Yeomans Brothers Co., 1433 Dayton St., Chicago, announces the appointment of two representatives. In Philadelphia, A. R. Amos, Jr., at 1014 Harrison Building, and in Des Moines, Ia., C. L. Knehr, 521 Hubbell Building. These representatives will handle the complete Yeomans line which includes sewage ejectors, bilge pumps, house pumps, and condensation return pumps.

United States Radiator Corp., Detroit, Mich., has opened a new assembly plant and warehouse on Avenue E, New Rochelle, N. Y., which is of brick and concrete construction and affords the company about 40,000 sq. ft. of floor space. The building will be able to take care of the trade requirements of Westchester County and as far up the Sound as Stamford, Conn. A sales office has been added to the company's warehouse at Harrison, N. J., and Harry Booth, manager of the metropolitan division, will supervise the operation of both plants. Mr. Booth's offices are at 101 Park Ave., New York.

Changes of Address

Caloroil Burner Corporation announces the removal of its executive offices to the Pennsylvania Bldg., at 225 West 34th St., New York.

Central Foundry Co., 41 East 42nd St., New York, has moved to the 12th floor of the new Graybar Bldg., at 420 Lexington Avenue.

Almirall & Co., Inc., announces the removal of its general offices to 53 Park Place (Dodge Bldg.,), New York.

Contracts Awarded

Burnap Bros., Emporia, Kan., heating and plumbing Kansas Avenue grade school building, in Emporia, for $14,495.50. Other bidders were: Fred Hensler, Atlantic, Ia., $14,680; Emporia Plumbing and Heating Co., Emporia, $14,841; Judd Plumbing and Heating Co., Excelsior Springs, Mo., $15,700; Winfield Plumbing and Heating Co., Winfield, $15,744; C. F. Rock Plumbing and Heating Co., St. Joseph, Mo., $16,299, and Golden Rule Plumbing and Heating Co., Wichita, $16,000.

Harry Knecht Co., Inc., West Collingswood, N. J., heating and ventilation of the Charles Summer School, Camden, N. J., for $31,000.

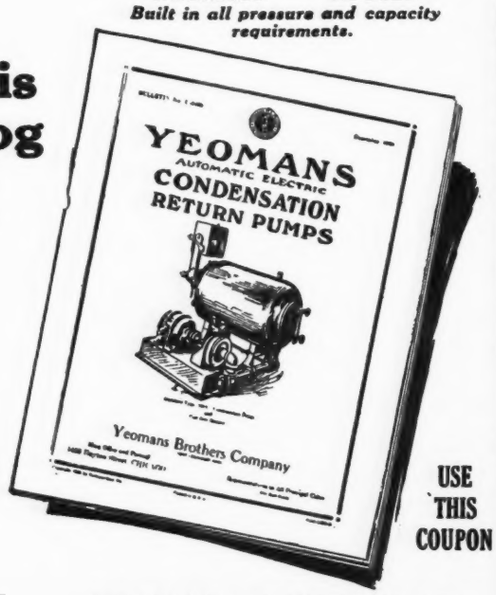
E. L. Veale, Abilene, Tex., heating and ventilating the municipal auditorium at Fair Park, Amarillo, for $14,000. By the use of this heating and ventilating system, temperature in the large auditorium will be maintained at 70° F. during coldest weather, and the ventilating apparatus will reduce the temperature in hot weather 10° below that outdoors.

Dixie Heating and Ventilating Co., Houston, Tex., cooling system for municipal auditorium, San Antonio, $60,784.

Fischer Heating Co., Memphis, Tenn., heating and ventilating new Junior High School, in Memphis, for $28,970. Schnell & Elmore, Memphis, have the plumbing contract at $14,054.

Send for this Catalog NOW

NOISELESS RUGGED
Built in all pressure and capacity requirements.



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Types
Plans
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YEOMANS BROTHERS CO.
Representatives in principal cities
1421 Dayton St., Chicago, Ill.

Please send catalog:

Name .....

Address .....

City .....*State*.....

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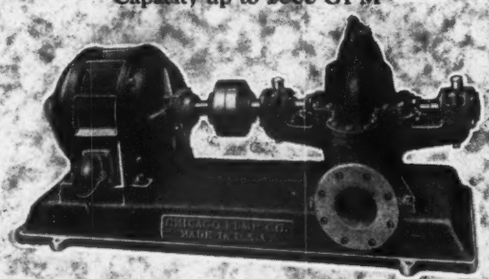
for **Refrigeration**
use Good "CHICAGO" Pumps
Type "D"
Single Stage Horizontally Split
Sizes 1½" to 6"
Capacity up to 2000 GPM



Ball Bearings—Balanced Impeller
Accurate Alignment—Filtered Oil

CHICAGO PUMP COMPANY
SEWAGE-CONDENSATION-CIRCULATING
BILGE-FIRE-HOUSE-VACUUM
2325 WOLFRAM ST. · · CHICAGO, ILL.